MAINTENANCE MANUAL

PS SERIES

MODELS: PS-3000, PS-6000, PS-12K, PS-30K
PS-3000S, PS-6000S, PS-15KS, PS-30KS

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APR. 2001 REV 1

Specifications and Function Subject to Change without Notice

1. INTRODUCTION

The PS series is designed according to IP-65 protection requirements to assure working properly under toughest environment.

Ender users should be advised not to undertake any troubleshooting except those listed on the operation manual.

This maintenance manual contains of certain information that may result in fraudulent use. Do not release any part of this manual to any end users or un-authorized persons.

The internal DIP S/W should be so set to prevent un-authorized settings or alternations.

Should a load cell has been replaced, make sure that the protection devices are properly set.

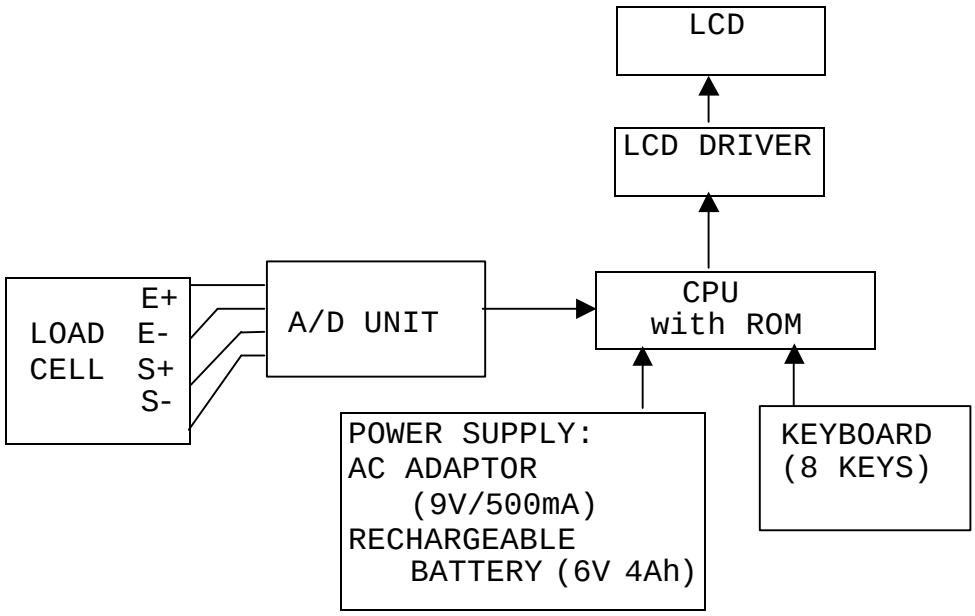
After servicing, it is necessary to go through all tests and procedures to ensure the scale meets all the meteorological and approval requirements.

Here are some features of the PS series

1. Zero indicator
2. Tare indicator
3. Negative value indicator
4. Subtractive tare function.
5. Power on zero function.
6. Manual zero function.
7. Auto Power Saving Function
8. Dual power: - By built-in rechargeable battery and external AC/DC power adaptor.
9. Low battery warning signal.
10. Dual color charge status indicator.
11. 2 Types of Calibration
12. Overload protection against positive and negative force
13. AC/DC power adaptor, adjustable feet included.
14. Dip Switch to prevent end-user calibration
15. Optional EL backlight facility.

2. SPECIFICATION

2.1 SYSTEM BLOCK DIAGRAM

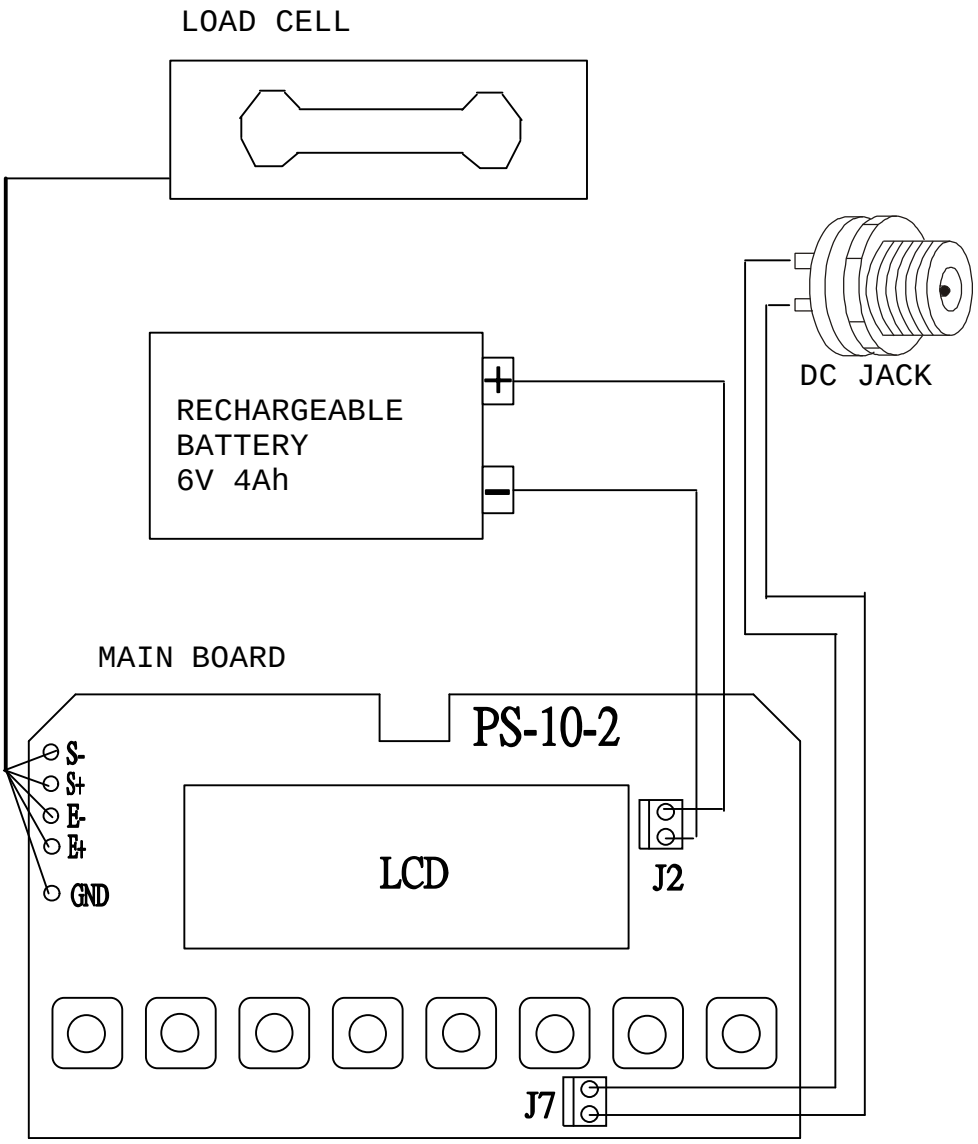


Description:
When an article is placed on the platter, the load of the article is applied to the load cell inside the scale.

The resistance to the excitation current in the strain gauge will then changed and the analog output signal varies.

It is amplified and digitized continuously by the A/D converter into a digital signal. Subsequently, the resulting count is processed and managed by the CPU. The CPU refers to the instructions from the keyboard, and then conveys the outputdata to LCD driver, which formats the data into readout on the display panels.

2.2 PHYSICAL LAYOUT OF ELECTRICAL CONNECTION



2.3 GENERAL SPECIFICATION

2.3.1 Overall View

2.3.2 Overall Dimension:

280(W) x 330(D) x 455(H)mm

2.3.3 Platter Size:

280 X 330mm

2.3.4 Model Specifications

Model Number	Capacity	Division
PS-3000	3000g	0.5g
PS-6000	6000g	1g
PS-12K	12kg	2g
PS-30K	30kg	5g
PS-3000S	3000g	1g
PS-6000S	6000g	2g
PS-15KS	15kg	5g
PS-30KS	30kg	10g
Tare Range	Full Tare	
Power on Zero Range	¡10%F.S.	
Manual Zero Range	¡2%F.S.	
Operation Environment	0^{o}~40^{o}C (32^{o}~104^{o}F), Non-condensed. R.H.¡ 85%	
Power Consumption	Normal = 0.1W Charging = 5W	
Power Source	Built-in Rechargeable Battery, or AC/DC Power Adaptor:DC9V 500mA	
Weight	Net/Gross Weight: 8.4/9.4kg	

2.3.5 Main Components Used

Microprocessors: 89C51
Crystal Oscillator: 6MHz
Display Device: WTN Liquid Crystal Display
5 1/2 digits,25mm height
Load Cell Used: **PS-3000,6000,12K,30K**
TEDEA 1022 Model
PS-3000S,6000S,15KS,30KS
NMB CB030 Model
Load Cell Capacity: PS-3000 = 7kg
PS-6000 = 10kg
PS-15 = 20kg
PS-30 = 35kg

2.3.6 Analog Specification

Input sensitivity: 2mV/V
Zero Drift: 0.02% R.O./10℃
Zero Balance Range: ¡2% of rate capacity
Load Cell Excitation Voltage: DV5V
A/D Conversion Speed: 10 times/second
Internal Resolution: 30000

3. INITIAL SETUP

3.1 INTERNAL FUNCTIONS AND SETTING METHODS

INTERNAL FUNCTION TABLE

Function	Symbol	Description
1	F.1	Span value reading and dealer calibration
2	F.2	Full display segment and max. capacity check
3	F.3	Check offset value and scale configuration
4	F.4	Auto power off setting

HOW TO ENTER THE REQUIRED FUNCTION MODE

a. Turn scale off.
b. Press and hold TARE, then turn scale on. Scale display F.1
c. Press TARE until the required function number appears.
d. Press MODE
e. Press MODE until the required setting appears.
f. Press TARE to confirm.
g. Repeat step c to f for other function setting, or
h. Press ZERO to save settings and return to normal operation.

F.1 Span Value Reading and Dealer Calibration

a. Simply enter F.1 to read the A/D counts.
b. Press ZERO to clear the A/D counts, apply test mass onto platter, the span value of test mass will be displayed.
c. Refer to Dealer Calibration procedures for dealer calibration.

F.2 Display Segment and Rated Capacity & Division Check

When function is entered, all segments will be displayed. Check and make sure that no segments are missed.

F.3 Total Internal Count Checking and Scale Configuration

a. Enter F.3, scale displays the Offset Value when unloaded.
b. Apply extra load onto platter, the total internal count value will be displayed.

SELECT WEIGHT UNITS

a. Press and hold MODE until the weight unit appears.
b. To employ all (metric and pound) weight units, press MODE until lb appears. To disable pound weight unit, press MODEuntil kg appears.
c. Press ZERO to save setting and back to normal operation status.

F.4 Auto Power Off Setting

Two modes are available: (Default=4_OFF)

0._OFF = Auto Power Off function is disabled.

4._OFF = Scale will automatically be turned off after 4minutes unused.

3.2 AUTO AND DEALER CALIBRATION PROCEDURES

ACCEPTABLE LOAD FOR AUTO AND DEALER CALIBRATION

Model Number	External Division	Acceptable Auto and Dealer Calibration Load	
PS-3000	1/6000	*2kg	1kg
PS-6000	1/6000	*4kg	2kg
PS-12K	1/6000	*10kg	5kg
PS-30K	1/6000	*20kg	10kg
PS-3000S	1/3000	*2kg	1kg
PS-6000S	1/3000	*4kg	2kg
PS-15KS	1/3000	*10kg	5kg
PS-30KS	1/3000	*20kg	10kg

* Recommended calibration load

Dealer Calibration Procedures:

1. Turn scale off.
2. Press and hold TARE, then turn scale on.
3. Scale displays F.1
4. Press MODE
5. Scale displays offset value
6. Press ZERO
7. Press TARE
8. Press ZERO
9. Press TARE
10. Press ZERO, scale displays a circle at the right hand of the display. It means the scale is ready for dealer calibration. Make sure that the figure being displayed is =0 or 1, If not, press ZERO again.
11. Load calibration either load as listed on above table.
12. When value displayed is stable, press MODE.
13. Wait until the scale starts countdown.
14. Calibration completed and scale is ready for operation.

Auto Calibration Procedures:

1. Turn scale off
2. Press and hold MODE, then turn scale on.
3. Scale displays CAL?
4. Press MODE

5. Scale displays LOAD XXXX or XXXX
6. Load calibration load according to above table.
7. Wait until the scale display DONE and starts count down.
8. Calibration completed and scale is ready for operation.

3.3 DISABLE CALIBRATION AND AVOIRDUPOIS WEIGHT UNITS WITH DIP SW. (S1)

The DIP SW.#1 is used to control calibration and avoirdupois weight units. Push this switch to ON position to disable calibration.

3.4 OFFSET AND SPAN VALUE DATA

OFFSET AND SPAN VALUE DATA TABLE

Model Number	Offset Value (Thousand)	Span Value(Thousand) at Various Load Applied		Offset Control	Span Control(Ohm) R1A
PS-3000	10~14	10~15 at 1kg	20~30 at 2kg	VR1 Trimmer	47K
PS-6000	10~14	10~15 at 2kg	20~30 at 4kg	VR1 Trimmer	40K
PS-12K	10~14	10-15 at 5kg	20-30 at 10kg	VR1 Trimmer	25K
PS-30K	10-14	10~15 at 10kg	20~30 at 20kg	VR1 Trimmer	25K
PS-3000S	10~14	10~15 at 1kg	20~30 at 2kg	VR1 Trimmer	47K
PS-6000S	10~14	10~15 at 2kg	20~30 at 4kg	VR1 Trimmer	40K
PS-15KS	10~14	10-15 at 5kg	20-30 at 10kg	VR1 Trimmer	25K
PS-30KS	10-14	10~15 at 10kg	20~30 at 20kg	VR1 Trimmer	25K

READING OFFSET VALUE

1 Turn scale off
2 Remove all load from platter
3 Enter F.3 and read the offset value

READING SPAN VALUE

1 Turn scale off
2 Remove all load from platter
3 Enter F.1
4 Press ZERO
5 Apply load to platter. Span value according to load applied will be displayed.

HOW TO ADJUST OFFSET VALUE

In case the offset value is out of range, adjust the trimmer located at VR1 on the main board to obtain correct offset value.

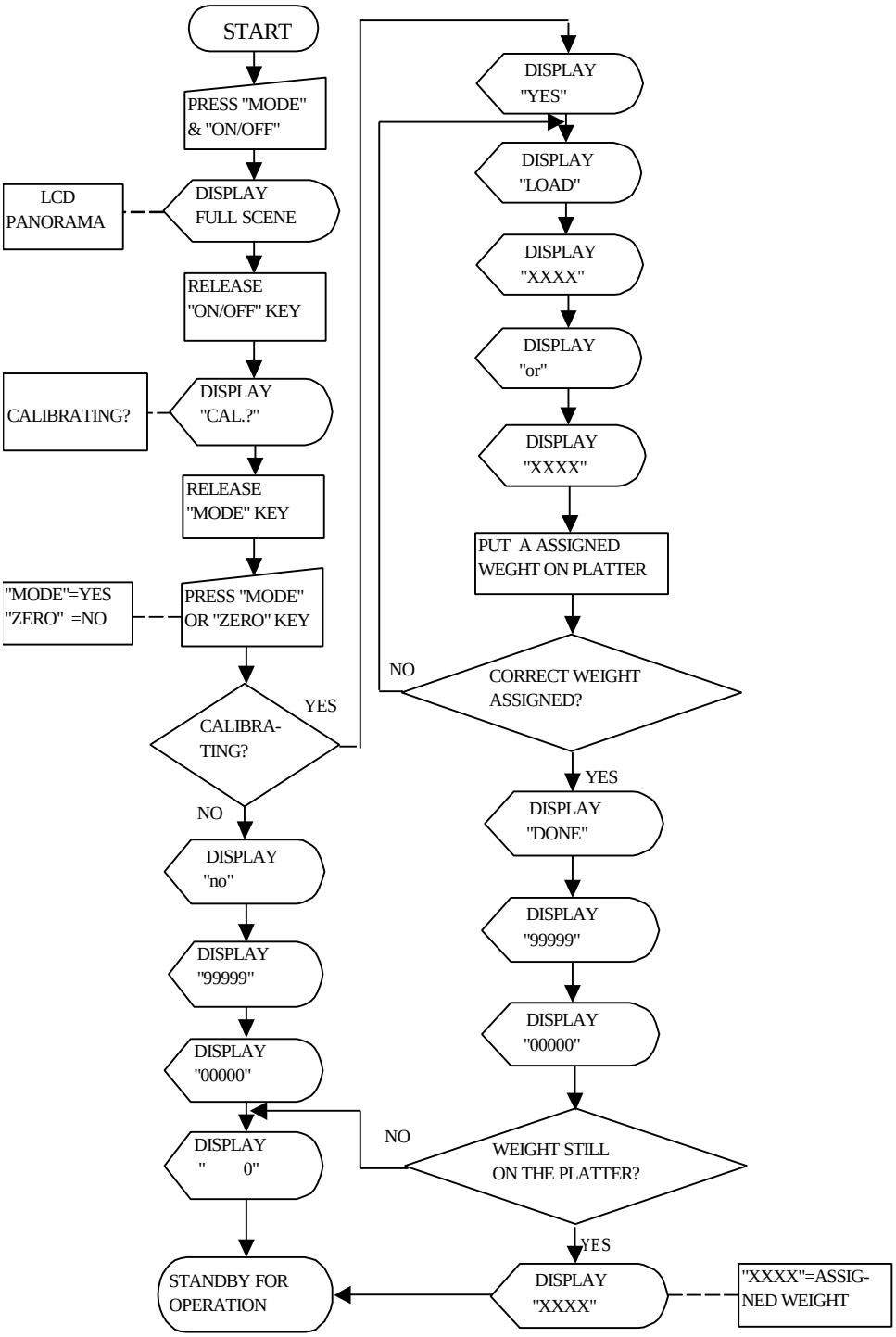
HOW TO ADJUST SPAN VALUE

The span value is controlled by resistor located on R1A, standard resistor value of R1A is listed on the above table. If the required span value is not attained, then change R1A resistor according to either case below:

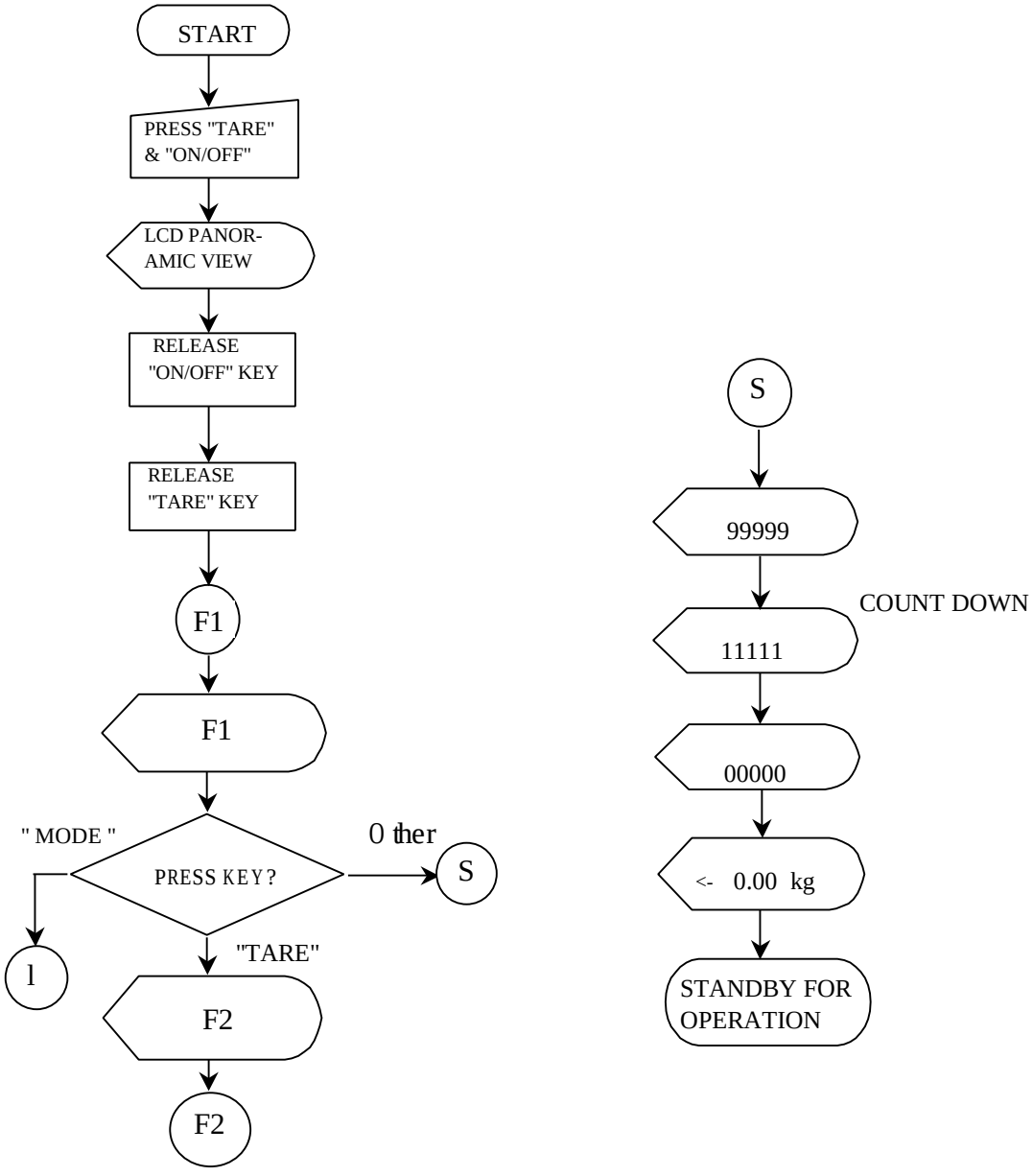
Span value too low: Increase the resistance of R1A.
Span value too high: Decrease the resistance of R1A.

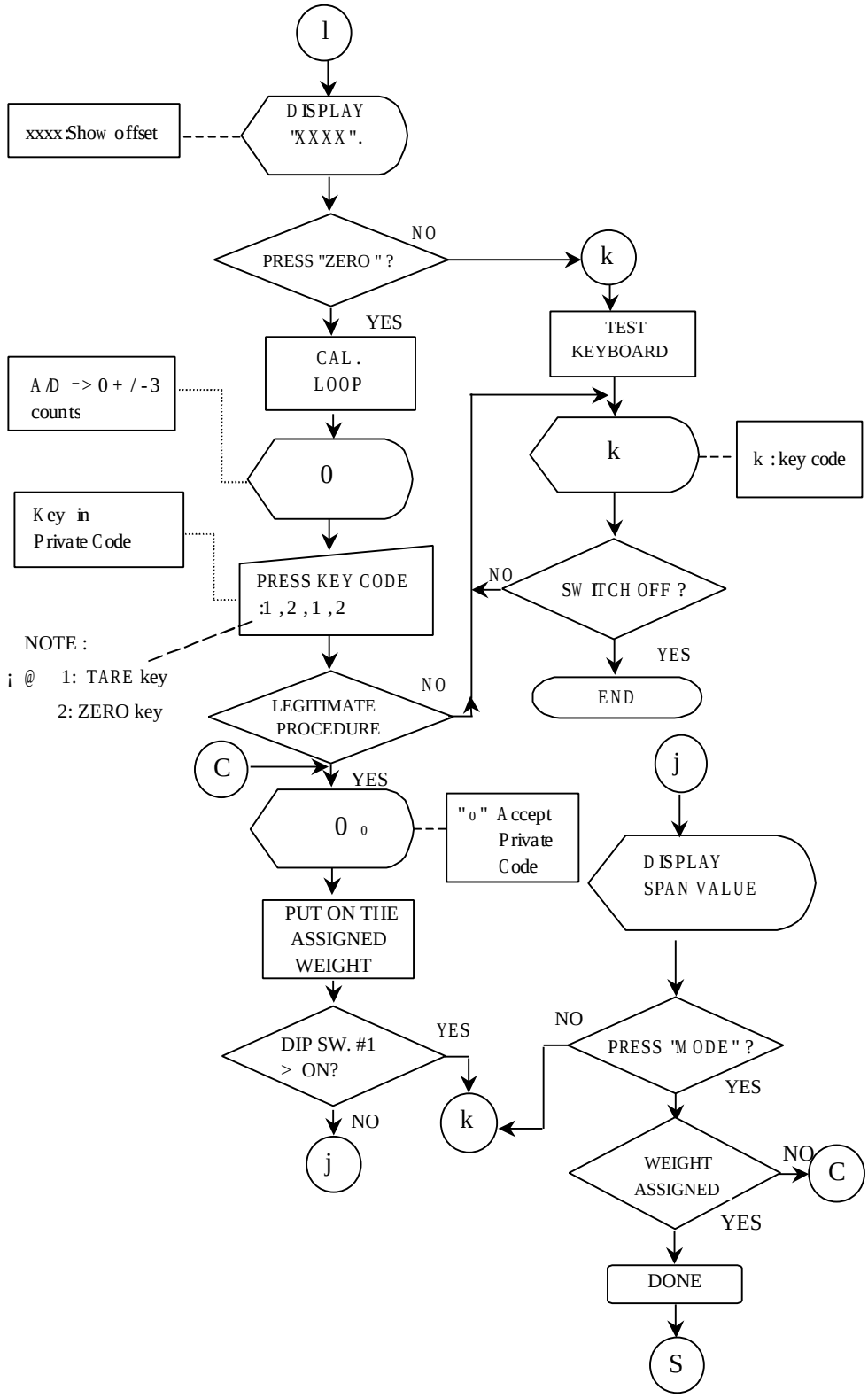
3.5 FLOW CHART

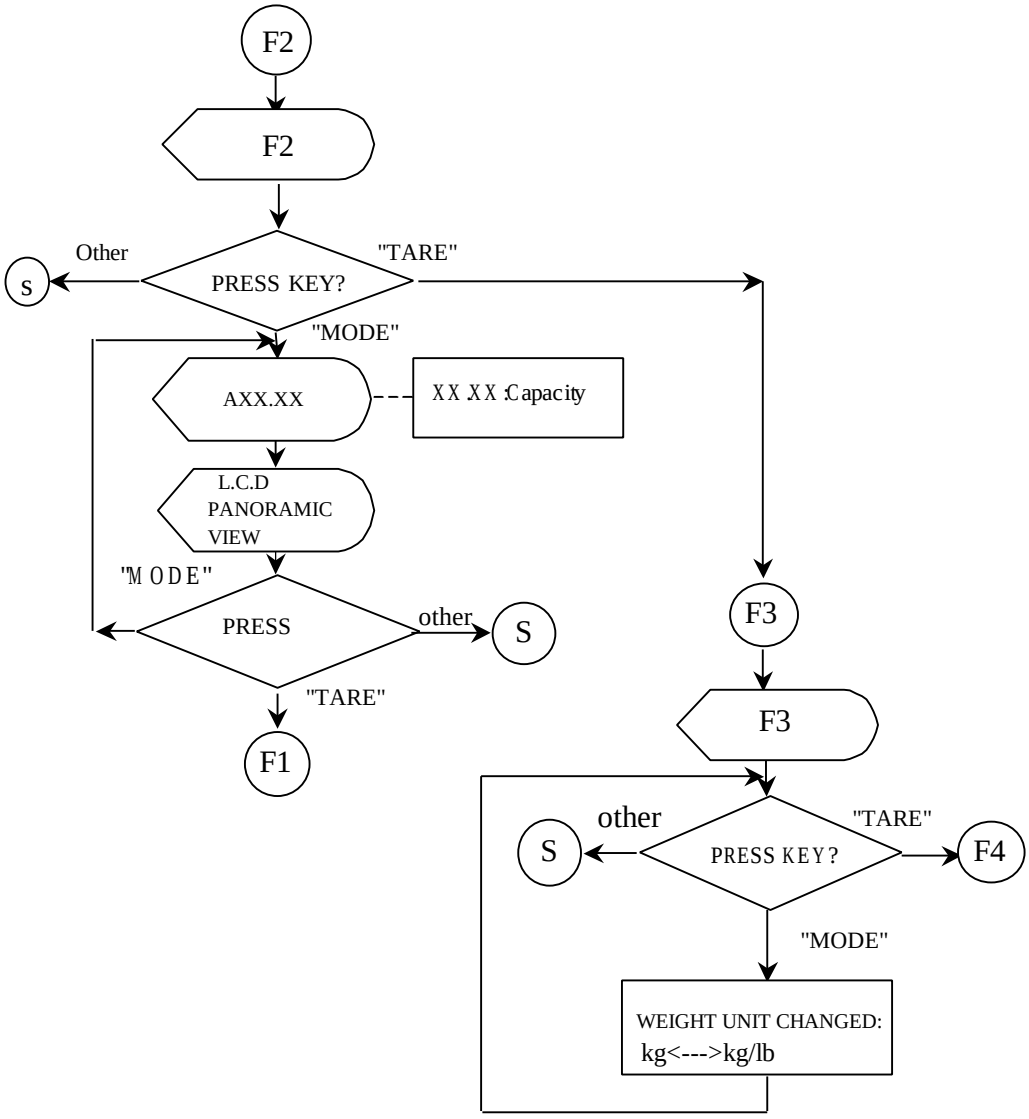
3.5.1 Auto Calibration (for end-user)

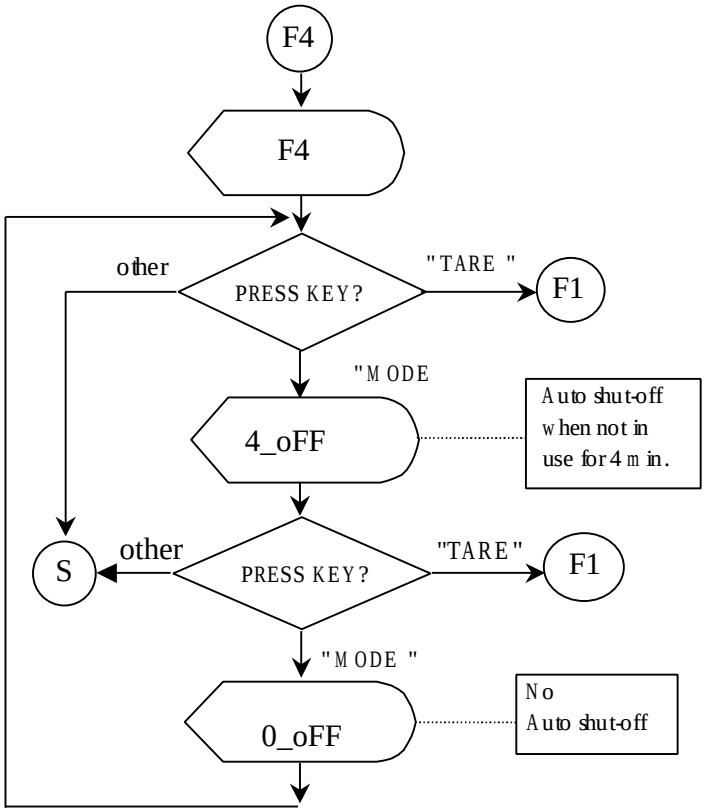


3.5.2 Function Test (for technicians only)



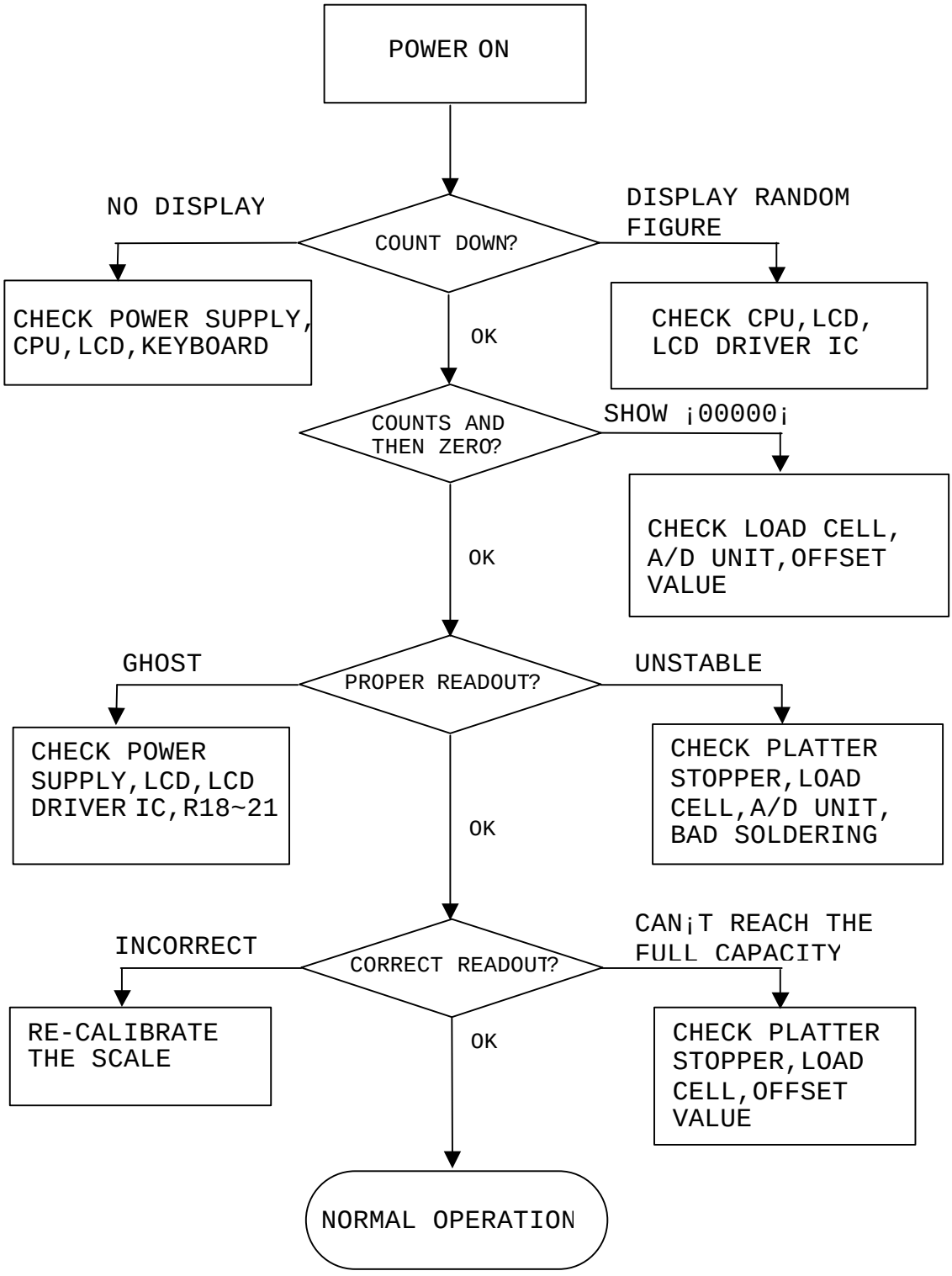

l
DISPLAY "XXXX".
xxxx:Show offset
PRESS "ZERO"?
NO
YES
k
TEST KEYBOARD
CAL. LOOP
A/D -> 0+/-3 counts
0
k
k : key code
Key in Private Code
PRESS KEY CODE :1,2,1,2
SWITCH OFF?
NO
YES
END
NOTE :
¡ @ 1: TARE key
2: ZERO key
LEGITIMATE PROCEDURE
NO
C
YES
j
0 0
"0" Accept Private Code
DISPLAY SPAN VALUE
PUT ON THE ASSIGNED WEIGHT
DIP SW. #1 -> ON?
YES
NO
k
j
PRESS "MODE"?
NO
YES
WEIGHT ASSIGNED
NO
C
YES
DONE
S


F2
F2
Other
PRESS KEY?
"TARE"
S
"MODE"
AXX.XX
XX.XX:Capacity
L.C.D
PANORAMIC
VIEW
"MODE"
PRESS
other
S
"TARE"
F1
F3
F3
other
"TARE"
S
PRESS KEY?
F4
"MODE"
WEIGHT UNIT CHANGED:
kg<--->kg/lb


F4
F4
other
PRESS KEY?
"TARE "
F1
"MODE
4_oFF
Auto shut-off
when not in
use for 4 min.
S
other
PRESS KEY?
"TARE"
F1
"MODE "
0_oFF
No
Auto shut-off

4. TROUBLE SHOOTING

4.1 TROUBLE SHOOTING LOOP

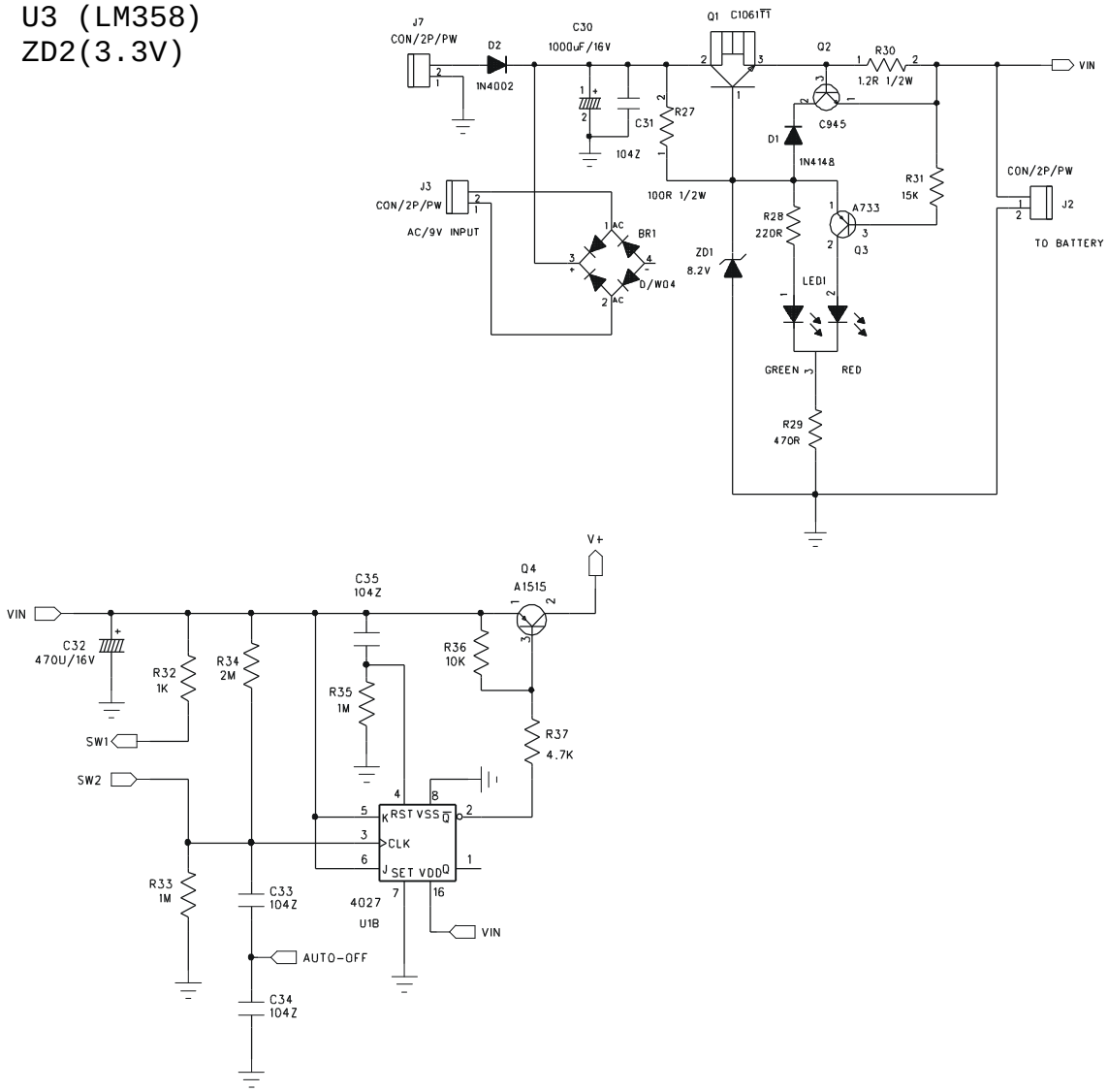


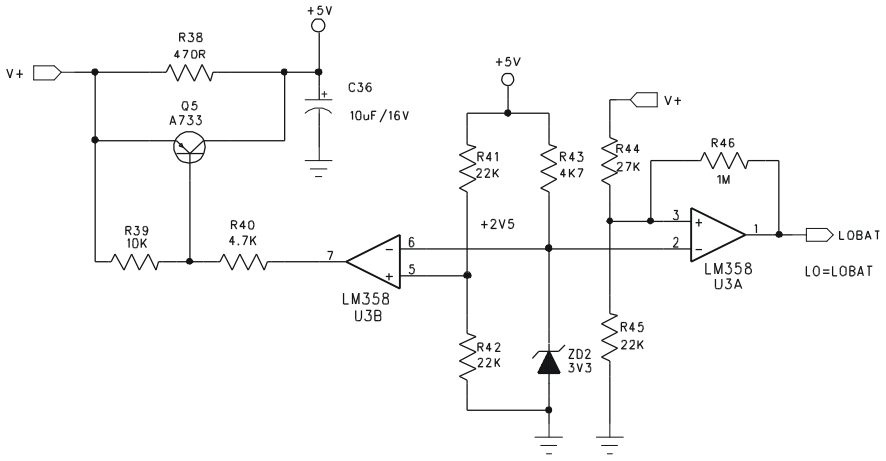
4.2 PARTS AND COMPONENTS TROUBLE SHOOTING

4.2.1 Power Supply Checking

4.2.1.1 Relevant parts:

Main Board (PS-10-X)
Q1 (C1061)
ZD1(8.2V)
BR1(W04/1A)
Q4 (A1515)
Q2 (C945)
Q5 (A733)
R30(1.2 ohm, 1/2W)
U1 (IC 4027)
U3 (LM358)
ZD2(3.3V)





Description:

1) AC Adaptor: This AC Adaptor provides power for DC9~12V,500mA.

2) Battery: Built-in Rechargeable Battery 6V/4Ah

3) How Battery is charged completely?
   The charging voltage is regulated by Q1 (C1061) and ZD1 (8.2V) for about 7 volts.
   The charging current will go down automatically when voltage reached.
   Q2(C945) and R30(1.2R, 1/2W) provide Over-Current protection.

4) +5V power drives digital circuit system.
   +5V power is created by U3B(LM358) with negative feedback technology.

5) +5V & -5V power drives analog circuit system.
   U12(AIC1722-50) and U11(IC 7660) are used to create +/-5V power.

6) Auto-off:
   If the scale is set on 4_oFF or even under LOBAT situation, after some minutes the CPU will release a positive pulse signal to change the U1(IC 4027) output state then makes Q4 cut-off, the scale will be shut off immediately.

7) Low Power Detection:
   U3A(LM358) is acted as a voltage comparator. When battery power is less than 5.5V, it will release a low potential signal to CPU, then CPU will instruct LCD display to show LOBAT symbol.

4.2.1.2 Input voltage: 5.5V or higher

Check and recharge battery if voltage less than 5.5V.
Check DC-JACK or AC Adaptor if been defective.

4.2.1.3 System voltage (Vcc): 5V +/- 10%

Check that the system voltage is within 5V +/- 10%
a) less than 4.5V, the CPU may not work properly.
b) more than 6V, ghost will appear on LCD.

4.2.2 Platter Stopper Checking

The platter device shall not touch anything around itself during operation. Check that the platter is not contacted with the upper (no load) and/or lower (with load) stopper.

4.2.3 LCD Display Checking

4.2.3.1 Check that it is soldered and connected properly between LCD and driver IC (uPD7225), driver IC (uPD7225) and CPU.

4.2.3.2 Check whether LCD is broken.

4.2.4 CPU Checking

4.2.4.1 Check that all pins are seated properly into the socket.

4.2.4.2 Check that the Crystal Oscillator works.

4.2.4.3 Check the RESET is normally low.

4.2.5 A/D Unit Checking

4.2.5.1 Check that the +3.3V & +/-5V powers are correctly fed to the A/D unit.

4.2.5.2 Check that the signal output of loadcell is normal.

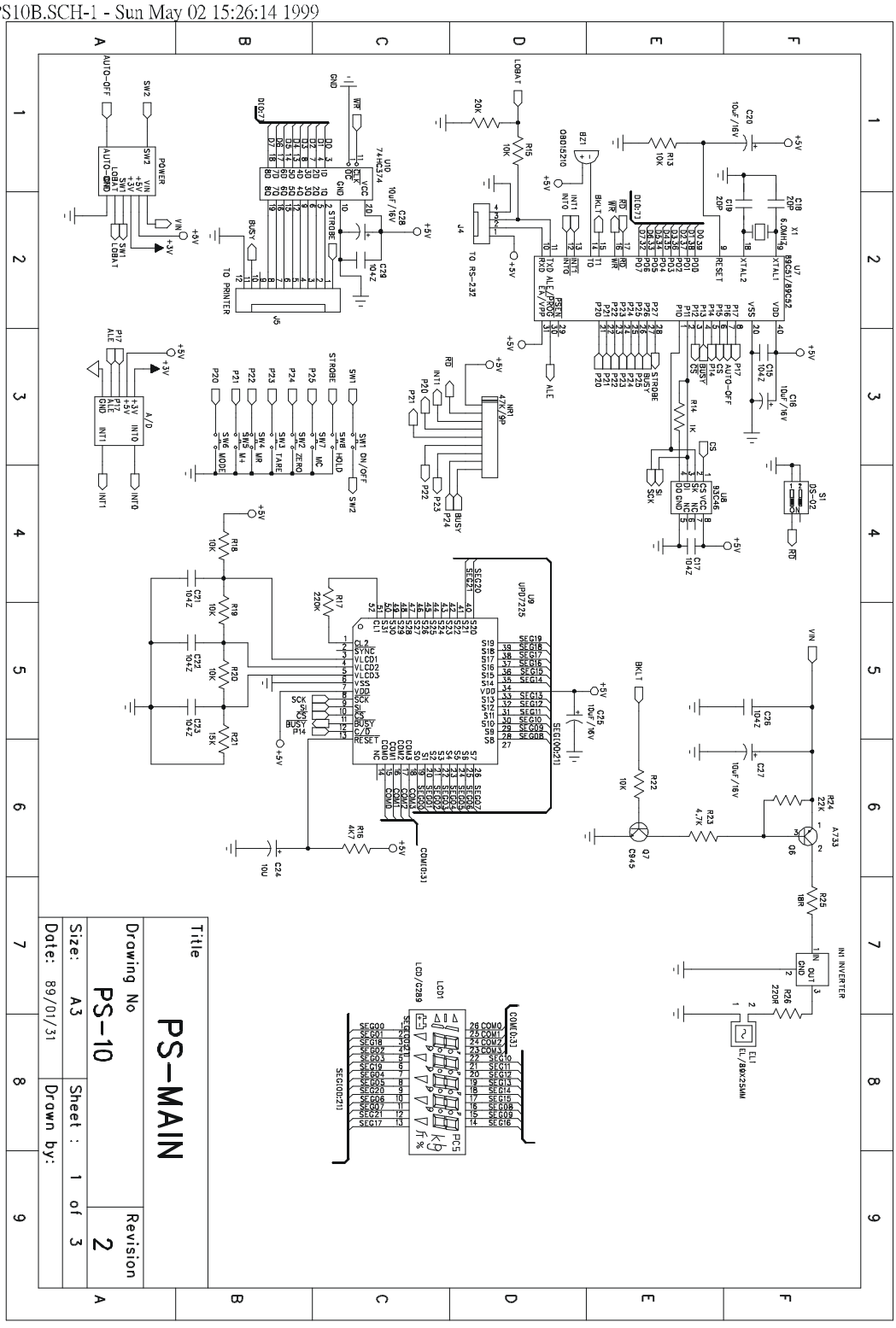
4.2.5.3 Check OP. Amplifiers & A/D Converter (AD7715).

When no error is found with the above checking procedures, the trouble can be caused on the loadcell or the PCB itself. Replace a new one could be better to identify the defective.

In this way, the readout of weight would be varied because of the output voltage of loadcell and different span value, so recalibration is required after this replacement.

5. ELECTRICAL CIRCUITRY

5.1 SCHEMATICS



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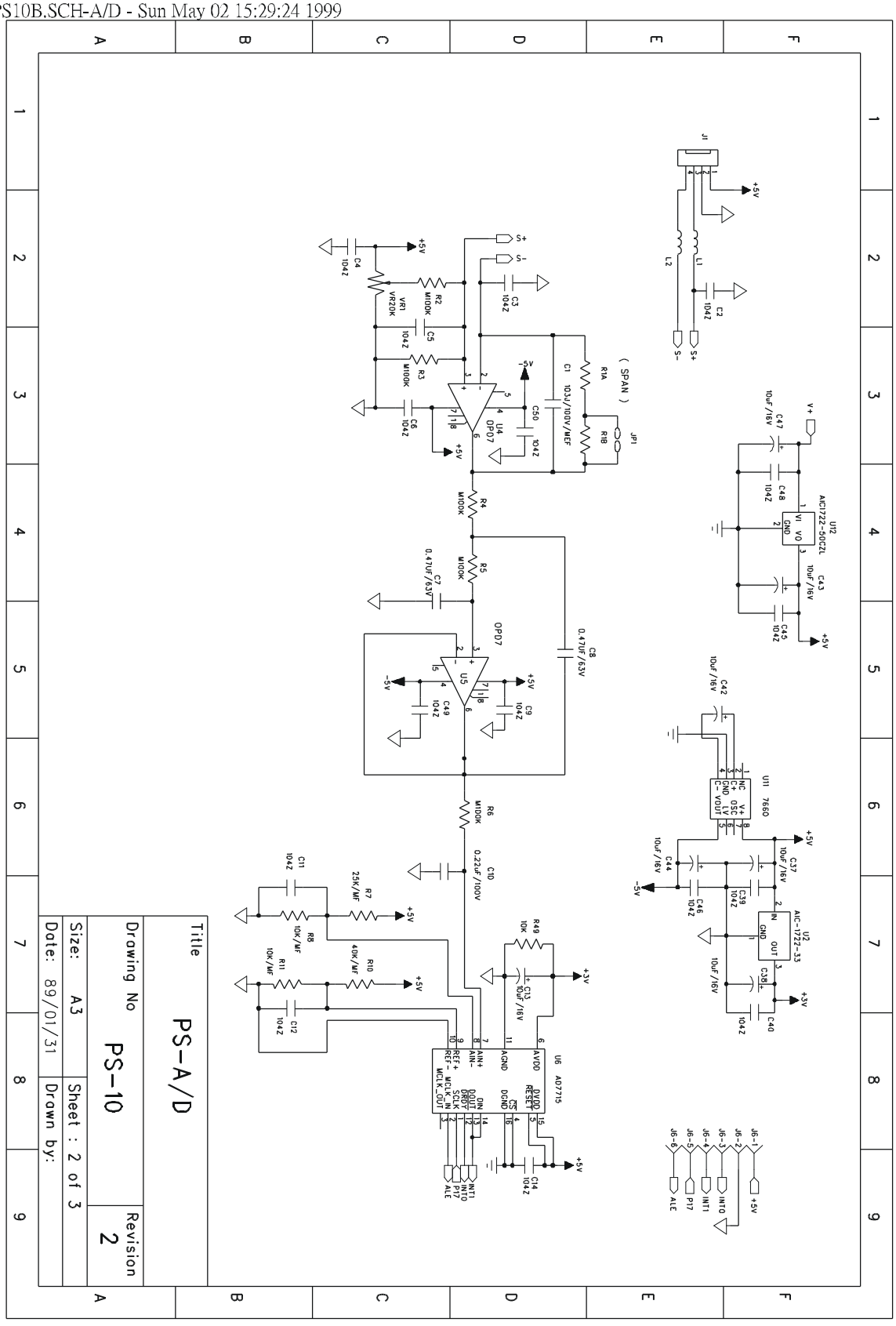
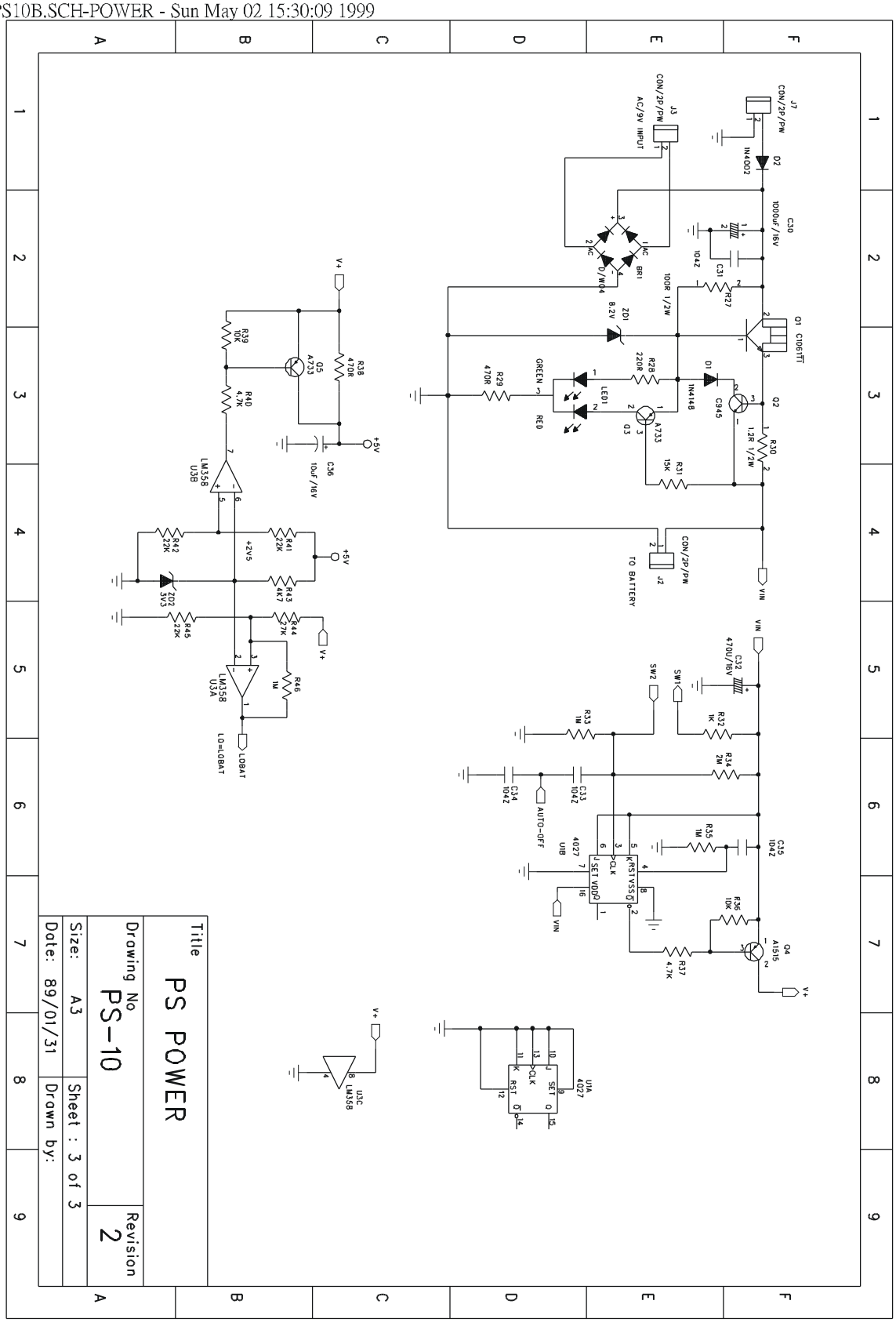
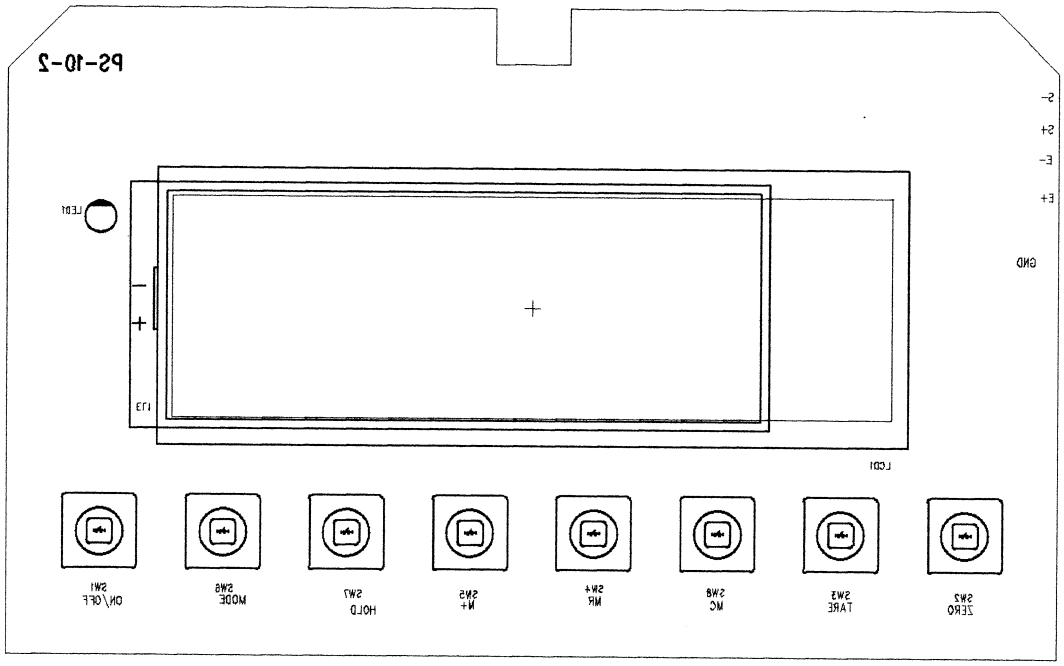


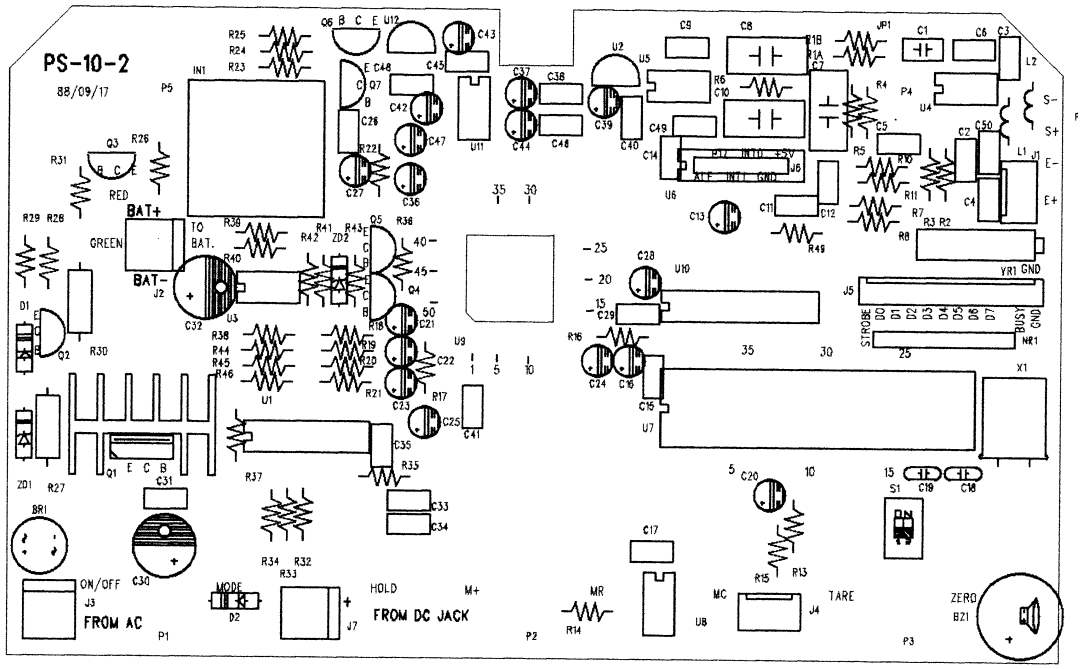
PS10B.SCH-POWER - Sun May 02 15:30:09 1999



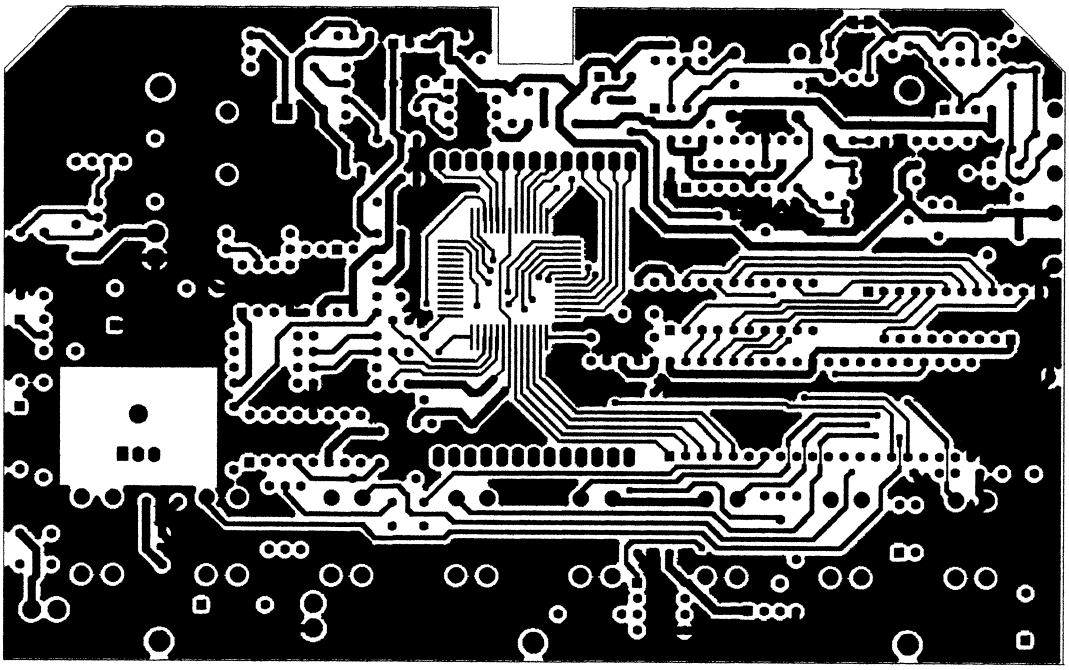
5.2 PCB LAYOUT



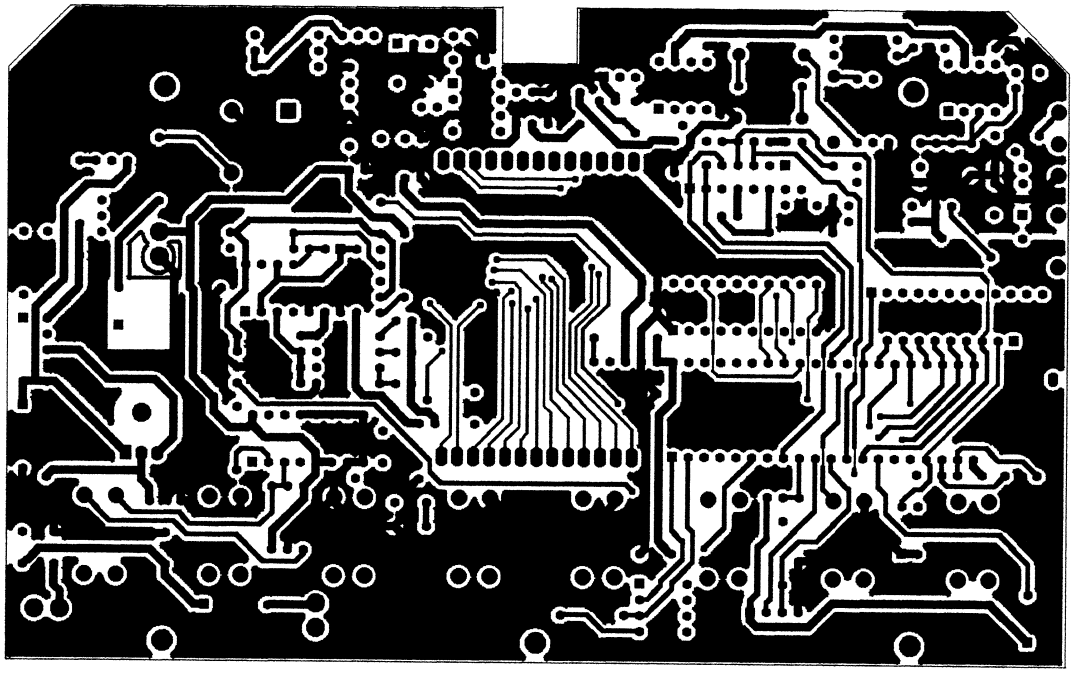
PS-10-2 BOTTOM OVERLAY



PS-10-2 TOP OVERLAY



PS-10-2 TOP LAYER



PS-10-2 BOTTOM LAYER

6. BILL OF MATERIAL

STRUCTURE

Parts No.	Description	Specification	Qty	Remark
A00590*****	LOADCELL	1022 or CB030	1	
A0950000011	CABLE CONNECTOR	LTW-6FM-90	1	
A5001000312	MOVABLE BUSHING	PS SERIES (AMB-1S)	1	
A60********	ADAPTOR	*** V/ 9V 500mA	1	
F0001PS1100	S/S HOUSING(UPPER)	PS SERIES	1	
F0001PS1000	S/S HOUSING(UNDER)	PS SERIES	1	
F0002PW0000	S/S PLATTER	PW SERIES	1	
F0003PS1100	LOAD CELL SUPPORT ¢	PW SERIES	1	UPPER
F0003PS1101	LOAD CELL SUPPORT ¢	PW SERIES	1	UNDER
F0003PS1102	LOAD CELL SUPPORT ¢	PS SERIES	1	UPPER
F0003PS1103	LOAD CELL SUPPORT ¢	PS SERIES	1	UNDER
F0004PS1000	S/S PILLAR	PS SERIES, L SHAPE	1	
F0009000035	S/S PLATE	PS SERIES, PILLAR SUPPORT	1	
F0029PS1000	S/S ADJUSTABLE FEET COVER	PS SERIES	4	
G0004BW1000	ADJUSTABLE FEET	BW SERIES	4	
G0004PS1000	PLASTIC FOOT	£ 8-10h	1	
G0004PW0100	RUBBER TUBE	PW SERIES	4	
G0005BW1000	PLATTER BEARING RUBBER	BW SERIES	4	
G0030PS1020	RUBBER PLUG	PS SERIES	1	
X1PS1000000	OPERATION MANUAL	PS SERIES	1	
Z0011200420	S/S SCREW (Ny-Lock)	M4x20	6	
Z0014100508	SCREW	M5x8	6	
Z0014100625	S/S SCREW	M6x25	4	
Z0015100406	S/S SCREW	M4x6	6	
Z0015100410	S/S SCREW	M4x10	10	
Z6BW1000010	PACKING MATERIAL	PM/BW SERIES	1	
A0906000210	DC JACK	SCD-21	1	
A0950000010	CONNECTOR(WATER PROOF)	LTW-6MS-C	1	
A1204040250	WIRE ARRAY	4 PIN 25cm	1	
A1208020351	BATTERY WIRE ARRAY	2PIN 35 cm, SINGLE HOUSING	1	

INDICATOR STRUCTURE

Parts No.	Description	Specification	Qty	Remark
A1600060400	RECHARGEABLE BATTERY	6V / 4Ah	1	
C1PS1******	OVERLAY PANEL PC	PS SERIES	1	
C1PS1000000	PC PLATE	PS SERIES (8 HOLES)	1	
E1PS1000011	P.C.B. KIT	PS-10-X	1	
F0003PS0000	S/S MOUNTING PLATE	PS SERIES	1	
F0005PS1000	S/S DISPLAY HOUSING	PS SERIES	1	FRONT
F0005PS1100	S/S DISPLAY HOUSING	PS SERIES	1	REAR
F0013FS0000	S/S BATTERY PLATE	NBS/FS/1705/PS	1	
F0022000010	S/S ADJUSTABLE FEET	FS INDICATOR FIXING	2	
G0030FS0000	RUBBER PLUG	DC JACK SCD-021	1	

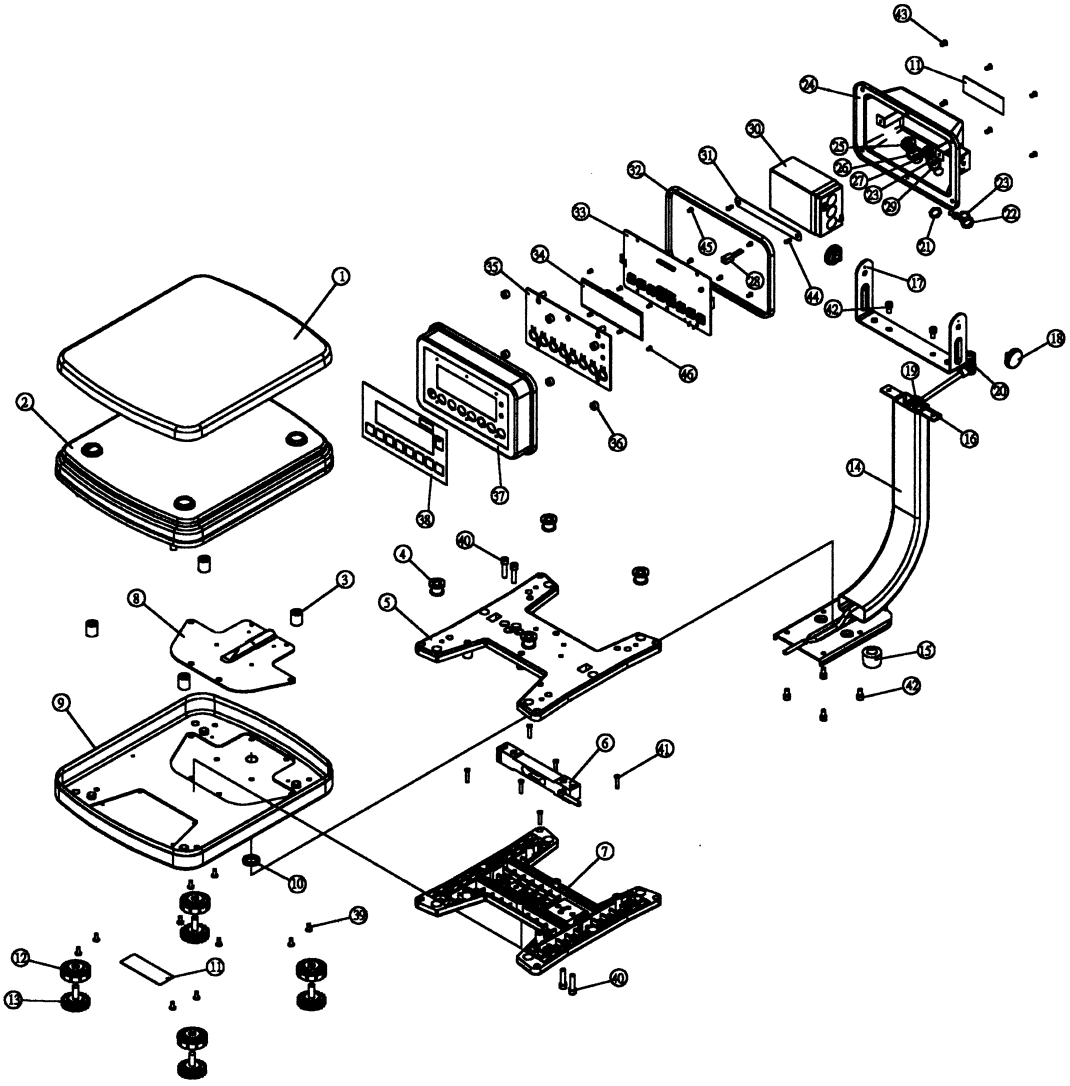
G0030PS1000	RUBBER PACKING	PS SERIES	6
G0030PS1010	RUBBER FRAME	PS SERIES	1
G0030PS1030	RUBBER PACKING	PS SERIES £ 21(£ 15.3)x5L	1
Z0010000306	SCREW	M3x5	6
Z0010000308	SCREW	M3x8	2
Z0010001305	SCREW	3x5 TAPPING	5

MAINBOARD

Parts No.	Description	Specification	Qty	Remark
E0PS1000000	P.C.B.	PS-10-X	1	
A0202093461	I.C.	93C46	1	U8
A0203077450	I.C.	AD7715AN-3	1	U6
A0205040270	I.C.	4027	1	U1
A0206000071	I.C.	OP-07CP	1	U5
A0206000072	I.C.	OP-177	1	U4
A0206003580	I.C.	LM358N	1	U3
A0207017223	VOLTAGE REGULATOR	AIC-1722-33CZT	1	U2
A0208072250	I.C.	UPD7225G	1	U9
A0300000040	I.C. SOCKET	40 PIN	1	U7
A0401001060	TRANSISTOR	2SC1061	1	Q1
A0401007330	TRANSISTOR	A733	3	Q3,5,6
A0401009450	TRANSISTOR	2SC945	2	Q2,7
A0401015150	TRANSISTOR	2SA1515	1	Q4
A0501004002	DIODE	1N4002	1	D2
A0501004148	DIODE	1N4148	1	D1
A0502000001	BRIDGE RECTIFIER	W 04/1A	1	BR1
A0503020033	ZENER	3.3V	1	ZD2
A0503020082	ZENER	1/2W 8.2V	1	ZD1
A0625050000	L.E.D.	GREEN/RED,ROUND,5£	1	LED1
A0701108016	CAPACITOR (EC)	1000uF/16V	1	C30
A0701477016	CAPACITOR (EC)	470uF/16V	1	C32
A0701106016	CAPACITOR (EC)	10uF/16V	8	C16,20,24,25,27 28,36,47
A0701106016	CAPACITOR (TC)	10uF/16V	6	C13,37,39,42,43,44
A0713474063	CAPACITOR (MEF)	0.47uF/63V(105)	3	C7,8,10
A0720103101	CAPACITOR (PEI)	0.01uF/100V(103J)	1	C1
A0730104050	CAPACITOR (MLC)	104Z	28	C2-6,9,11,12,14,15, 17,21-23,26,29,31, 33-35,38,40-41,45, 46,48-50
A0740020050	CAPACITOR (CC)	20pF	2	C18-19
A0803041002	METAL FILM RESISTOR	10K£ 1/4W	2	R8,11
A0803042502	METAL FILM RESISTOR	25K£ 1/4W	1	R7
A0803044002	METAL FILM RESISTOR	40K£ 1/4W	1	R10
A0804041003	METAL FILM RESISTOR	100K£ 1/4W	5	R2-6
A0804041272	METAL FILM RESISTOR	27K£ 1/4W	1	R44
A0805020120	CARBON FILM RESISTOR	1.2£ 1/2W	1	R30

A0805021101	CARBON FILM RESISTOR	100Ω	1/2W	1	R27
A0805041102	CARBON FILM RESISTOR	1KΩ	1/4W	2	R14,32
A0805041103	CARBON FILM RESISTOR	10KΩ	1/4W	9	R13,15,18-20,22, 36,39,49
A0805041105	CARBON FILM RESISTOR	1MΩ	1/4W	3	R33,35,46
A0805041205	CARBON FILM RESISTOR	2MΩ	1/4W	1	R34
A0805041334	CARBON FILM RESISTOR	330KΩ	1/4W	1	R17
A0805041153	CARBON FILM RESISTOR	15KΩ	1/4W	1	R31
A0805041203	CARBON FILM RESISTOR	20KΩ	1/4W	1	R21
A0805041221	CARBON FILM RESISTOR	220Ω	1/4W	2	R26,28
A0805041223	CARBON FILM RESISTOR	22KΩ	1/4W	4	R24,41,42,45
A0805041471	CARBON FILM RESISTOR	470Ω	1/4W	2	R29,38
A0805041473	CARBON FILM RESISTOR	4.7KΩ	1/4W	5	R16,23,37,40,43
A0801001203	TRIMMER	3006P-001-203 (20K)		1	VR1
A0802047309	RESISTOR NETWORK	47KΩ	9 PIN	1	NR1
A0902010020	CONNECTOR(POWER)	2 PIN WAFFER		3	J2,3,7
A0910000080	CONNECTOR(FPC)	8 PIN (ZIF)		2	J2,J8
A0910100130	SOCKET STRIPS	SIP 1*13 (FEMALE)		2	LCD
A1100260000	CRYSTAL	6.0MHZ		1	X1
A1301000002	DIP SW.	DS-02 (4 PIN)		1	S1
A1306000003	TACT SW.	KPT-1104B		8	SW1-8
A1400000006	BACK LIGHT	130*44mm		1	EL1
A1401005120	INVERTER	5V TO 120V		1	IN1
A1500000004	BUZZER	OBO-15210		1	BZ1
A5005000110	JUMPER	10mm		2	L1-2
A0102000289	L.C.D.	G289		1	
A0201089511	I.C.	89C51		1	

7. APPENDIX
PARTS EXPLOSION:



ITEM	PART NUMBER	PART NAME	SPECIFICATION	QTY
1	F0002PW0000	S/S PLATTER	PW/PS SERIES	1
2	F0001PS1100	S/S HOUSING (UPPER)	PS SERIES	1
3	G0004PW0100	RUBBER TUBE	PW/PS SERIES	4
4	G0005BW1000	PLATTER BEARING RUBBER	BW/PS SERIES	4
5	F0003PS110*	LOAD CELL SUPPORT (UNDER)	PS SERIES	1
6	A0071000***	LOAD CELL		1
7	F0003PS1100	LOAD CELL SUPPORT (UPPER)	PS SERIES	1
8	F0009000035	S/S PLATE	PILLAR SUPPORT	1
9	F0001PS1000	S/S HOUSING (UNDER)	PS SERIES	1
10	A5001000312	MOVABLE BUSHING	PS(AMB-1S)	1
11		NAME PLATE		2
12	F0029PS1000	S/S ADJUSTABLE FEET COVER	PS ADJUSTABLE FEET	4
13	G0004BW1000	ADJUSTABLE FEET	BW/PS SERIES	4
14	F0004PS1000	S/S PILLAR	PS SERIES	1
15	G0004PS1000	PLASTIC FOOT	¡ 8-10h	1
16	A5001000301	CABLE TIE	CV-120S	1
17	F0003PS0000	S/S MOUNTING PLATE, U SHAPE	INDICATOR FIXING	1
18	F0022000010	S/S ADJUSTABLE FEET	INDICATOR FIXING	2
19	G0030PS1020	RUBBER PLUG	PS SERIES	1
20	A0950000011	CABLE CONNECTOR (FEMALE)	LTW-6FM	1
21	A0950000010	NUT	LTW-6MS-C	1
22	A0906000210	RUBBER PLUG	SCD-21	1
23	A0906000210	NUT	SCD-21	2
24	F0005PS1100	S/S DISPLAY HOUSING (REAR)	PS SERIES	1
25	A0950000010	CABLE CONNECTOR (MALE)	LTW-6MS-C	1
26	G0030PS1030	RUBBER PACKING	PS SERIES £ 21(£ 15.3)x5L	1
27	A0906000210	DC JACK	SCD-21(BLACK)	1
28	A1208020351	BATTERY WIRE ARRAY	2 PIN,35cm	1
29	G0030FS0000	RUBBER RING	SCD-21	1
30	A1600060400	RECHANGEABLE BATTERY	GP4-6 6V,4Ah	1
31	F0013FS0000	S/S BATTERY PLATE	FS/1705L/PS	1
32	G0030PS1010	RUBBER FRAME	PS SERIES	1
33	E1PS1000011	P.C.B	PS-10-X	1
34	A0102000289	L.C.D.	UTN-G289JV	1
35	C1PS1000000	PC PLATE (8 HOLES)	PS SERIES	1
36	G0030PS1000	RUBBER PACKING	PS SERIES	6
37	F0005PS1000	S/S DISPLAY HOUSING (FRONT)	PS SERIES	1
38	C1PS1XXXXX	OVERLAY PANEL PC	PS SERIES	1
39	Z0015100410	S/S SCREW	M4*10	10
40	Z0014000625	S/S SCREW	M6*25	4
41	Z0011000420	S/S SCREW	M4*20	6
42	Z0014000508	SCREW	M5*8	6
43	Z0015100406	S/S SCREW	M4*6	6
44	Z0010000308	SCREW	M3*8	2
45	Z0010001305	SCREW	3*5	5
46	Z0010000306	SCREW	M3*5	6

Features

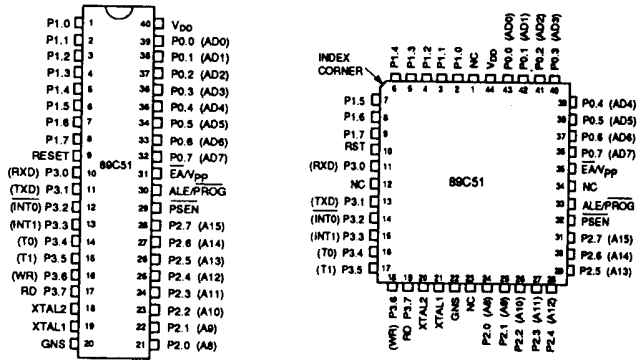
- Compatible with MCS-51[1] Products
- 4K Bytes of In-Circuit Re-Programmable Flash Memory
  - Endurance: 1000 Write/Erase Cycles
  - Data Retention: 10 Years
- Wide Operating Voltage Range: V_{CC} = 2.7V to 6V
- Fully Static Operation: 0 Hz to 16 MHz
- 3-Level Program Memory Lock
- 128 x 8-Bit Internal RAM
- 32 Programmable I/O Lines
- Two 16-Bit Timer/Counters
- 5 Interrupt Sources
- Programmable Serial Channel
- Low Power Idle and Power Down Modes

Description

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K Bytes of Flash Programmable and Erasable Read Only Memory (PEROM). The device is manufactured using Atmel's high density nonvolatile memory technology and is compatible with the industry standard 80C51 instruction set and pinout. The on-chip PEROM allows the program memory to be reprogrammed in-circuit or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with PEROM on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.

The AT89C51 provides the following standard features: 4K Bytes of PEROM, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, a five source two-level interrupt architecture, a full duplex serial port, on-chip oscillator and clock circuitry. The AT89C51 supplies all the necessary timing and high-voltage functions required for programming the PEROM array, and no external support circuits are required.

Pin Out



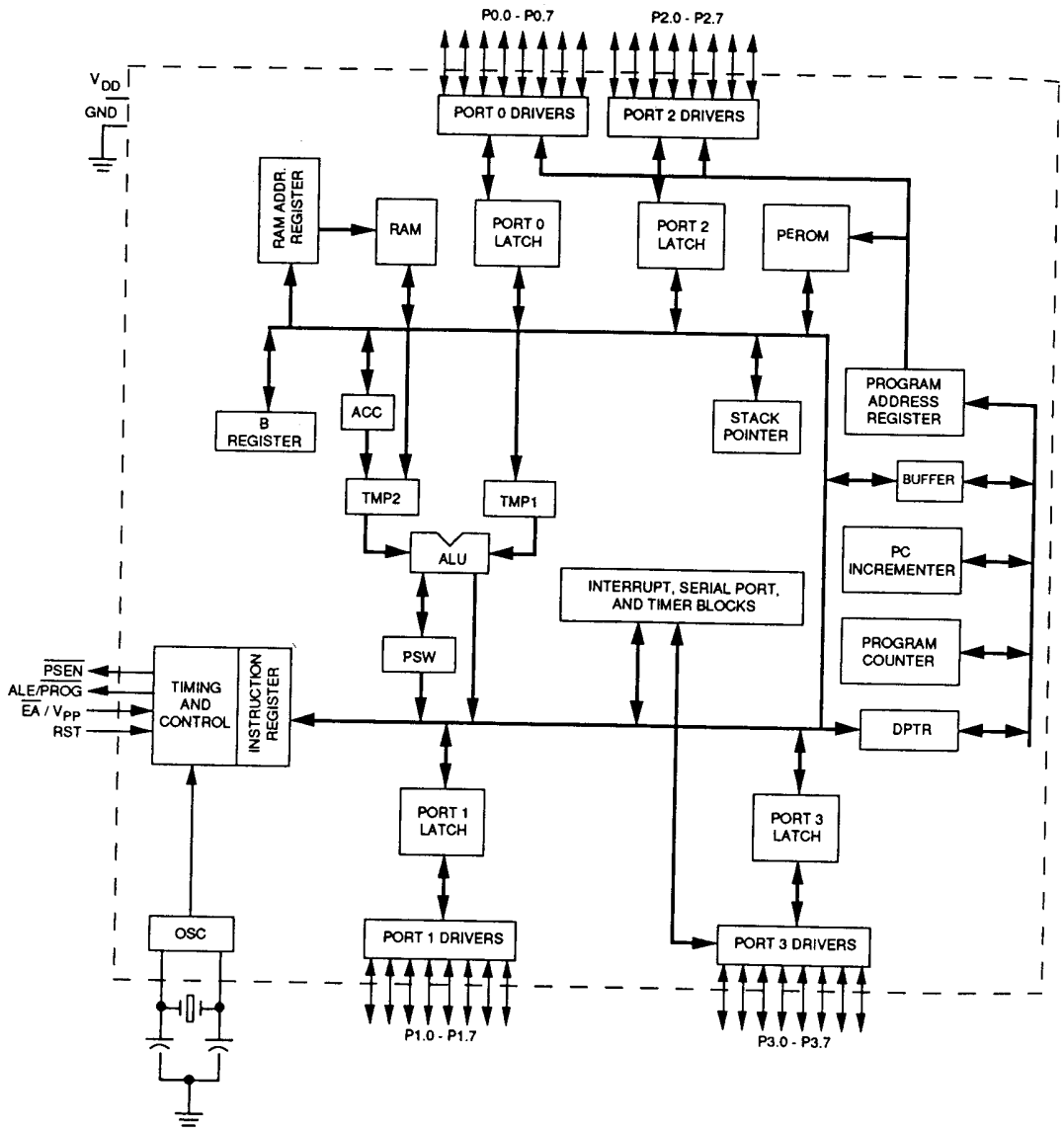
(1) MCS-51 is a registered trademark of Intel Corporation.

8-Bit Microcontroller with 4K Byte Flash

AT89C51 Preliminary

12

AT89C51 Block Diagram



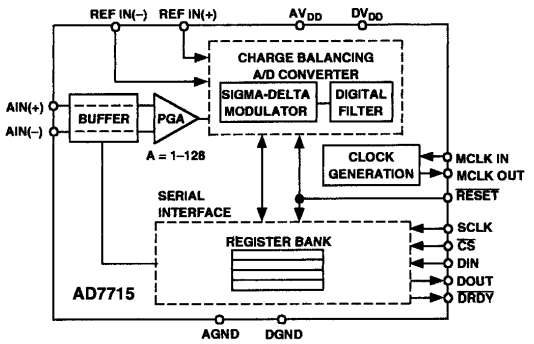
3 V/5 V, 450 μA 16-Bit, Sigma-Delta ADC

AD7715*

FEATURES

Charge-Balancing ADC
16 Bits No Missing Codes
0.0015% Nonlinearity
Programmable Gain Front End
Gains of 1, 2, 32 and 128
Differential Input Capability
Three-Wire Serial Interface
SPI™, QSPI™, MICROWIRE™ and DSP Compatible
Ability to Buffer the Analog Input
3 V (AD7715-3) or 5 V (AD7715-5) Operation
Low Supply Current: 450 μA max @ 3 V Supplies
Low-Pass Filter with Programmable Output Update
16-Lead SOIC/DIP/TSSOP

FUNCTIONAL BLOCK DIAGRAM



GENERAL DESCRIPTION

The AD7715 is a complete analog front end for low frequency measurement applications. The part can accept low level input signals directly from a transducer and outputs a serial digital word. It employs a sigma-delta conversion technique to realize up to 16 bits of no missing codes performance. The input signal is applied to a proprietary programmable gain front end based around an analog modulator. The modulator output is processed by an on-chip digital filter. The first notch of this digital filter can be programmed via the on-chip control register allowing adjustment of the filter cutoff and output update rate.

The AD7715 features a differential analog input as well as a differential reference input. It operates from a single supply (+3 V or +5 V). It can handle unipolar input signal ranges of 0 mV to +20 mV, 0 mV to +80 mV, 0 V to +1.25 V and 0 V to +2.5 V. It can also handle bipolar input signal ranges of ±20 mV, ±80 mV, ±1.25 V and ±2.5 V. These bipolar ranges are referenced to the negative input of the differential analog input. The AD7715 thus performs all signal conditioning and conversion for a single-channel system.

The AD7715 is ideal for use in smart, microcontroller or DSP based systems. It features a serial interface that can be configured for three-wire operation. Gain settings, signal polarity and update rate selection can be configured in software using the input serial port. The part contains self-calibration and system calibration options to eliminate gain and offset errors on the part itself or in the system.

CMOS construction ensures very low power dissipation, and the power-down mode reduces the standby power consumption to 50 μW typ. The part is available in a 16-lead, 0.3 inch-wide, plastic dual-in-line package (DIP) as well as a 16-lead 0.3 inch-wide small outline (SOIC) package and a 16-lead TSSOP package.

PRODUCT HIGHLIGHTS

1. The AD7715 consumes less than 450 μA in total supply current at 3 V supplies and 1 MHz master clock, making it ideal for use in low-power systems. Standby current is less than 10 μA.
2. The programmable gain input allows the AD7715 to accept input signals directly from a strain gage or transducer removing a considerable amount of signal conditioning.
3. The AD7715 is ideal for microcontroller or DSP processor applications with a three-wire serial interface reducing the number of interconnect lines and reducing the number of opto-couplers required in isolated systems. The part contains on-chip registers which allow software control over output update rate, input gain, signal polarity and calibration modes.
4. The part features excellent static performance specifications with 16-bits no missing codes, ±0.0015% accuracy and low rms noise (<550 nV). Endpoint errors and the effects of temperature drift are eliminated by on-chip calibration options, which remove zero-scale and full-scale errors.

SPI and QSPI are trademarks of Motorola, Inc.
MICROWIRE is a trademark of National Semiconductor Corporation.
*Protected by U.S. Patent No: 5,134,401.
See page 30 for data sheet index.

REV. B

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Fax: 781/326-8703
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AD7715-3–SPECIFICATIONS (AV_{DD} = +3 V, DV_{DD} = +3 V, REF IN (+) = +1.25 V; REF IN(–) = AGND; $f_{CLK\ IN}$ = 2.4576 MHz unless otherwise noted. All specifications T_{MIN} to T_{MAX} unless otherwise noted.) AD7715

Parameter	A Version[1]	Units	Conditions/Comments
STATIC PERFORMANCE			
No Missing Codes	16	Bits min	Guaranteed by Design. Filter Notch ≤ 60 Hz
Output Noise	See Tables IX to XII		Depends on Filter Cutoffs and Selected Gain
Integral Nonlinearity	±0.0015	% of FSR max	Filter Notch ≤ 60 Hz
Unipolar Offset Error	See Note 2		
Unipolar Offset Drift[3]	0.2	µV/°C typ	
Bipolar Zero Error	See Note 2		
Bipolar Zero Drift[3]	0.2	µV/°C typ	
Positive Full-Scale Error[4]	See Note 2		
Full-Scale Drift[3, 5]	0.2	µV/°C typ	
Gain Error[6]	See Note 2		
Gain Drift[3, 7]	0.2	ppm of FSR/°C typ	
Bipolar Negative Full-Scale Error[2]	±0.003	% of FSR max	Typically ±0.0004%
Bipolar Negative Full-Scale Drift[3]	1	µV/°C typ	For Gains of 1 and 2
	0.6	µV/°C typ	For Gains of 32 and 128
ANALOG INPUTS/REFERENCE INPUTS			Specifications for AIN and REF IN Unless Noted
Input Common-Mode Rejection (CMR)	90	dB min	at DC. Typically 102 dB
Normal-Mode 50 Hz Rejection[8]	98	dB min	For Filter Notches of 25 Hz, 50 Hz, $\pm 0.02 \times f_{NOTCH}$
Normal-Mode 60 Hz Rejection[8]	98	dB min	For Filter Notches of 20 Hz, 60 Hz, $\pm 0.02 \times f_{NOTCH}$
Common-Mode 50 Hz Rejection[8]	150	dB min	For Filter Notches of 25 Hz, 50 Hz, $\pm 0.02 \times f_{NOTCH}$
Common-Mode 60 Hz Rejection[8]	150	dB min	For Filter Notches of 20 Hz, 60 Hz, $\pm 0.02 \times f_{NOTCH}$
Common-Mode Voltage Range[9]	AGND to AV_{DD}	V min to V max	AIN for BUF Bit of Setup Register = 0 and REF IN
Absolute AIN/REF IN Voltage[8]	AGND – 30 mV	V min	AIN for BUF Bit of Setup Register = 0 and REF IN
	AV_{DD} + 30 mV	V max	
Absolute/Common-Mode AIN Voltage[9]	AGND + 50 mV	V min	BUF Bit of Setup Register = 1
	AV_{DD} – 1.5 V	V max	
AIN DC Input Current[8]	1	nA max	
AIN Sampling Capacitance[8]	10	pF max	
AIN Differential Voltage Range[10]	0 to $+V_{REF}$/GAIN[11]	nom	Unipolar Input Range (B/U Bit of Setup Register = 1)
	$\pm V_{REF}$/GAIN	nom	Bipolar Input Range (B/U Bit of Setup Register = 0)
AIN Input Sampling Rate, f_S	GAIN × $f_{CLK\ IN}$/64		For Gains of 1 and 2
	$f_{CLK\ IN}$/8		For Gains of 32 and 128
REF IN(+) – REF IN(–) Voltage	+1.25	V nom	±1% for Specified Performance. Functional with Lower V_{REF}
REF IN Input Sampling Rate, f_S	$f_{CLK\ IN}$/64		
LOGIC INPUTS			
Input Current	±10	µA max	
All Inputs Except MCLK IN			
V_{INL}, Input Low Voltage	0.8	V max	
V_{INH}, Input High Voltage	2.0	V min	
MCLK IN Only			
V_{INL}, Input Low Voltage	0.4	V max	
V_{INH}, Input High Voltage	2.5	V min	
LOGIC OUTPUTS (Including MCLK OUT)			
V_{OL}, Output Low Voltage	0.4	V max	I_{SINK} = 100 µA Except for MCLK OUT[12]
V_{OH}, Output High Voltage	DV_{DD} – 0.6	V min	I_{SOURCE} = 100 µA Except for MCLK OUT[12]
Floating State Leakage Current	±10	µA max	
Floating State Output Capacitance[13]	9	pF typ	
Data Output Coding	Binary		Unipolar Mode
	Offset Binary		Bipolar Mode

μPD7225
CMOS, Intelligent, Alphanumeric LCD Controller/Driver

Description

The μPD7225 is an intelligent peripheral device designed to interface most microprocessors with a wide variety of alphanumeric LCDs. It can directly drive any static or multiplexed LCD containing up to 4 backplanes and up to 32 segments and is easily cascaded for larger LCD applications. The μPD7225 communicates with a host microprocessor through an 8-bit serial interface. It includes a 7-segment numeric and a 14-segment alphanumeric segment decoder to reduce system software requirements. The μPD7225 is manufactured with a low power consumption CMOS process allowing use of a single power supply between 2.7 V and 5.5 V. It is available in a space-saving 52-pin plastic flat package.

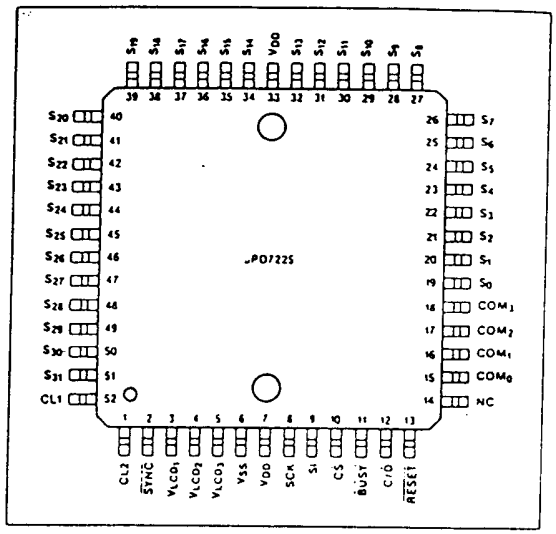
Features

- ☐ Single chip LCD controller with direct LCD drive
- ☐ Low cost serial interface to most microprocessors
- ☐ Compatible with
  - — 7-segment numeric LCD configurations up to 16 digits
  - — 14-segment alphanumeric LCD configurations up to 8 characters
- ☐ Selectable LCD drive configuration:
  - — Static, biplexed, triplexed, or quadruplexed
- ☐ 32-segment drivers
- ☐ Cascadable for larger LCD applications
- ☐ Selectable LCD bias voltage configuration:
  - — Static, 1/2 or 1/3
- ☐ Hardware logic blocks reduce system software requirements
  - — 8-bit serial interface
  - — Two 32 × 4-bit static RAMs for display data and blinking data storage
  - — Programmable segment decoding capability:
    - 16-character, 7-segment numeric decoder
    - 64-character, 14-segment USASCII alphanumeric decoder
  - — Programmable segment blinking capability
  - — Automatic synchronization of segment drivers with sequentially multiplexed backplane drivers
- ☐ Single power supply, variable from 2.7 V to 5.5 V
- ☐ Low power consumption CMOS technology
- ☐ Extended −40°C to +85°C temperature range available

Ordering Information

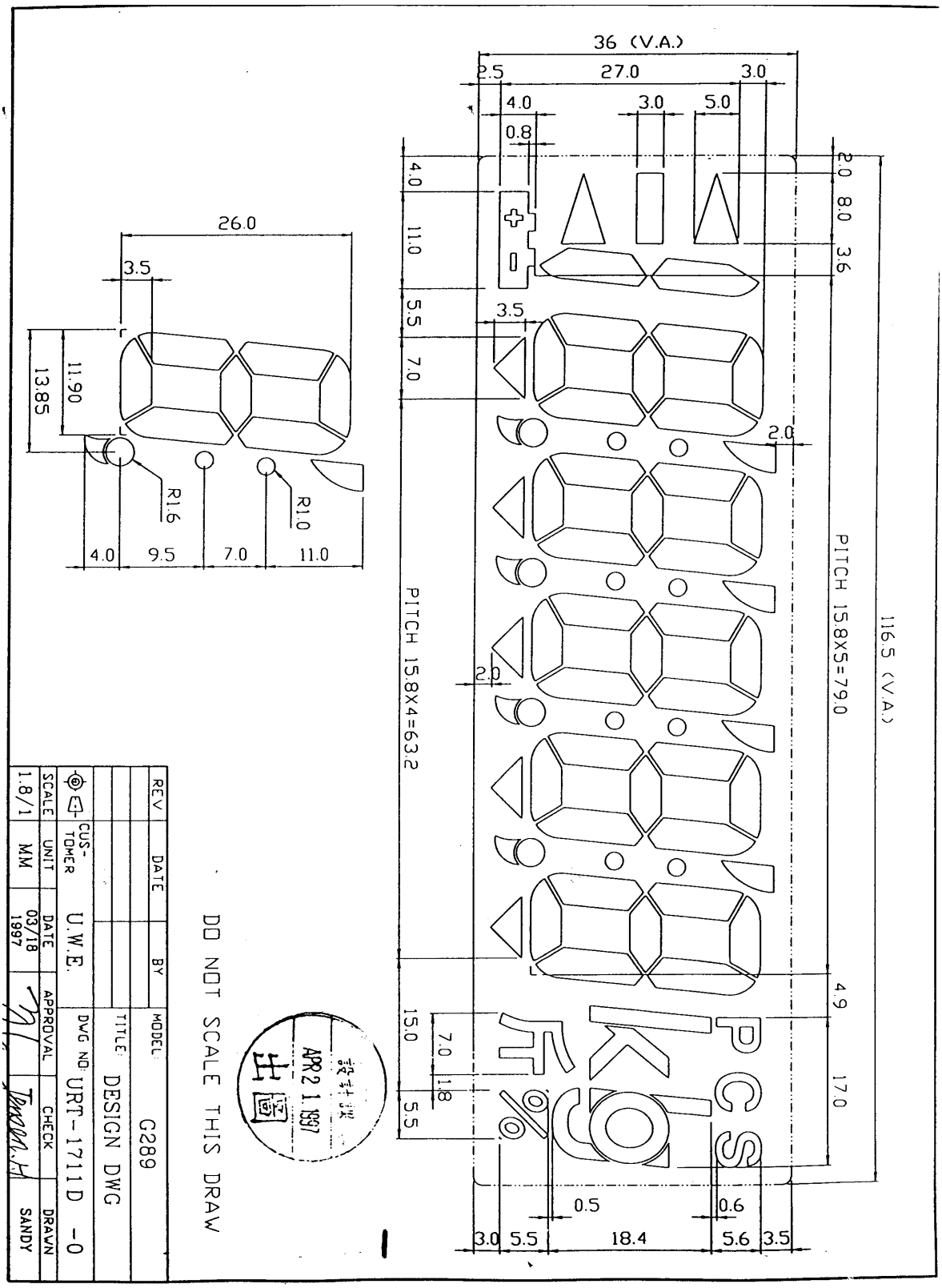
Part Number	Package Type	Max Frequency of Operation
μPD7225G-00	52-pin plastic miniflat	1 MHz

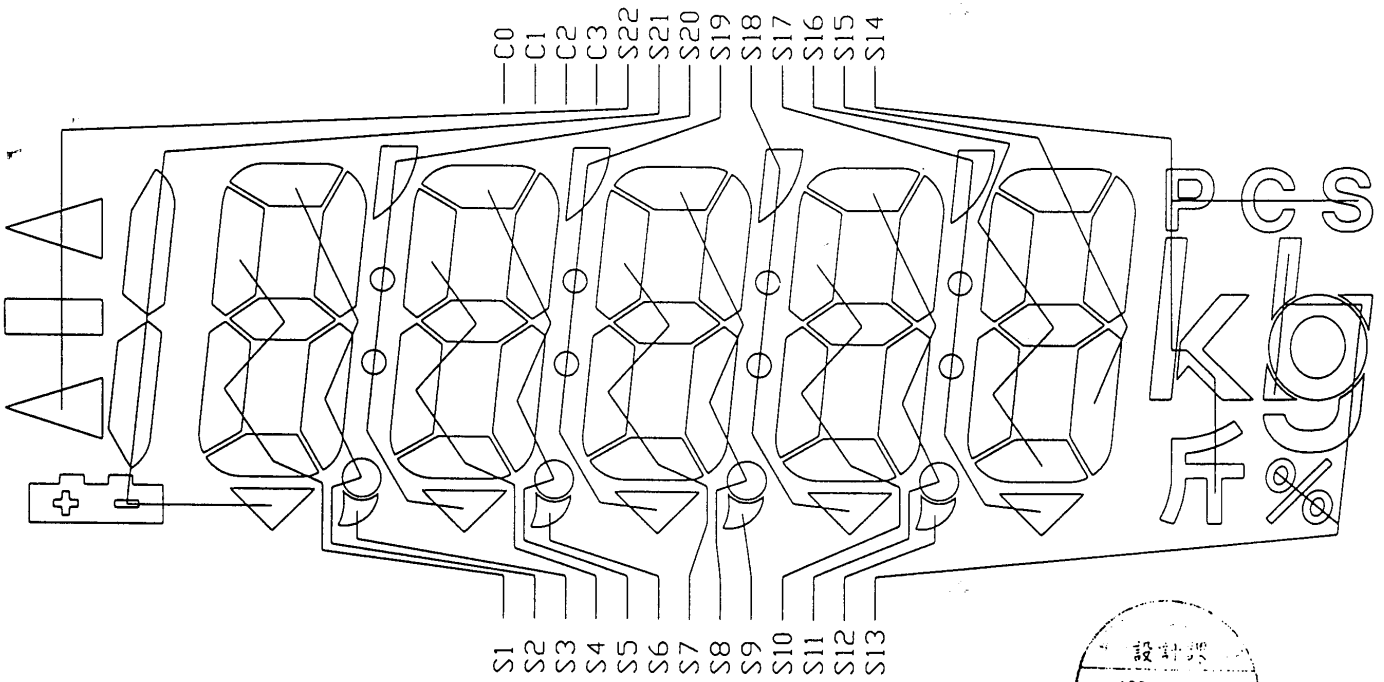
Pin Configuration



Pin Identification

No.	Symbol	Function
1	CL2	System clock output
2	$\overline{SYNC}$	Synchronization port
3-5	V_{LCD1}-V_{LCD3}	LCD bias voltage supply inputs
6	V_{SS}	Ground
7, 33	V_{DD}	Power
8	$\overline{SCK}$	Serial clock input
9	SI	Serial input
10	$\overline{CS}$	Chip select
11	$\overline{BUSY}$	Busy output
12	$C/\overline{D}$	Command or data select input
13	$\overline{RESET}$	Reset input
14	NC	No connection
15-18	COM_0-COM_3	LCD backplane driver outputs
19-32, 34-51	S_0-S_{31}	LCD segment driver outputs
52	CL1	System clock input


36 (V.A.)
2.5
27.0
3.0
4.0
3.0
5.0
0.8
2.0
8.0
3.6
4.0
11.0
5.5
7.0
3.5
2.0
PITCH 15.8X5=79.0
116.5 (V.A.)
PITCH 15.8X4=63.2
2.0
4.9
17.0
15.0
7.0
1.8
5.5
0.5
0.6
3.0
5.5
18.4
5.6
3.5
26.0
3.5
11.90
13.85
R1.6
R1.0
4.0
9.5
7.0
11.0
DO NOT SCALE THIS DRAW
APR 2 1 1997
REV
DATE
BY
MODEL
G289
CUS-TOMER
U.W.E.
DWG NO
URT-1711D -0
TITLE
DESIGN DWG
SCALE
1.8/1
UNIT
MM
DATE
03/18 1997
APPROVAL
CHECK
DRAWN
SANDY



APR 2 1. 1997
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SEGMENT

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	CUS-TOMER	U.W.E.	DWG NO: URT-1711 W1 -0

SCALE	UNIT	DATE	APPROVAL	CHECK	DRAWN
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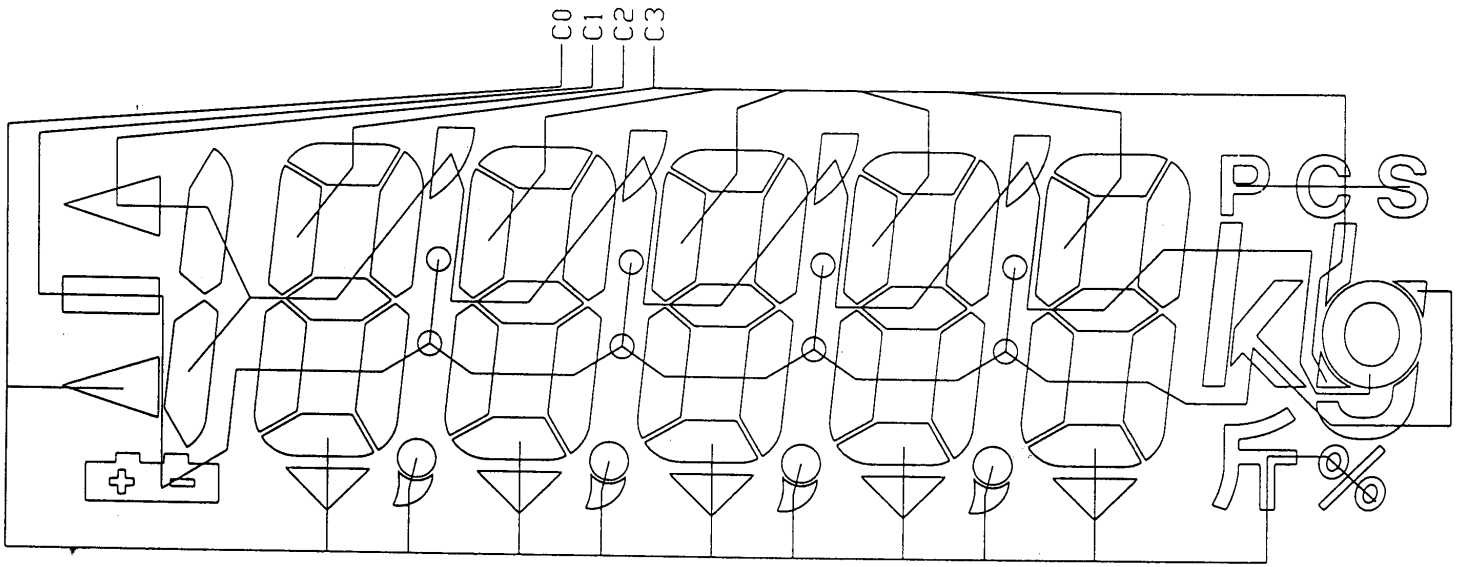

APR 21 1997
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COMMON

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	CUS-TOMER U.W.E.		DWG NO: URT-1711W2 -0

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URT-BE-303-02A